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INTRODUCTION

Scientific and Technical Aerospace Reports (*STAR*) is a major component of a comprehensive National Aeronautics and Space Administration information system covering aeronautics, space, and supporting disciplines. *STAR* is issued on the 8th and 23rd of each month and announces current publications of the following types:

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- Dissertations and theses

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By arrangement between NASA and the Smithsonian Science Information Exchange (SSIE), a separate section of information on aerospace-related *On-Going Research Projects* is inserted into each issue of *STAR*. The insert presents titles of active NASA grants and university contracts, summary portions of recently updated *NASA Research and Technology Operating Plans (RTOPs)*, and notices of non-NASA research projects that were funded in the most recent or current fiscal year. The latter are selected by SSIE. The project announcements in the insert are arranged by *STAR* divisions but are otherwise entirely separate from *STAR*. They are not indexed nor machine-searchable by NASA. Current and retrospective searches are available from SSIE, 1730 M Street, N.W., Washington, D.C. 20036.

Subject scope of *STAR*, *IAA*, and *On-Going Research Projects* includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

Other NASA publications and information services are described in a booklet, *The NASA Scientific and Technical Information System . . . and How to Use It*, available without charge from the NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Maryland 21240.

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STAR is categorized by 10 major subdivisions divided into 74 specific subject categories and one general category/division. These are presented in the Table of Contents. Documents announced in *STAR* are not ordinarily cross-referenced between categories, except for certain conference reports or book translations that have had separate abstracts written for their component papers or chapters. Citations and abstracts of the components follow immediately after those of the parent document. When the subject content of a component differs sufficiently from the general content of the parent, a cross-reference citation also is printed at the end of the category to which it normally would have been assigned if it were independent.

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VOLUME 13 NUMBER 15 / AUGUST 8, 1975

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 1751

02 AERODYNAMICS 1751

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 1759

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 1761

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 1762

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 1763

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 1764

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 1768

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 1769

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 1770

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 1771

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 1773

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 1773

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 1774

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 1774

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 1775

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION 1777
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 1777
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS
Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 1779
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 1780
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 1784
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 1787
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 1792
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 1794
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

ENGINEERING
Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics*.

31 ENGINEERING (GENERAL) 1795
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 1796
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 1800
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 1803
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 1808
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 1815
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 1818
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 1822
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 1823
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES
Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) 1826

43 EARTH RESOURCES 1827
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 1832
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 1840
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 1845
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 1848
Includes weather forecasting and modification.

48 OCEANOGRAPHY 1853
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 1856
Includes genetics.

52 AEROSPACE MEDICINE 1859
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 1864
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 1865
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY 1866
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 1867
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 1868
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 1871
Includes computer networks.

63 CYBERNETICS 1872
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 1873
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY N.A.
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 1874
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 1874
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) 1874
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 1875
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS 1875
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 1876
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS 1878
Includes light phenomena.

75 PLASMA PHYSICS 1880
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS 1882
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS 1886
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) 1887
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 1887
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 1888
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS 1889
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1889
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) 1891

89 ASTRONOMY 1895
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1898
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1899
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 1903
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1904
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL 1905

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-53
CORPORATE SOURCE INDEX I-61
CONTRACT NUMBER INDEX I-77
REPORT/ACCESSION NUMBER INDEX I-81

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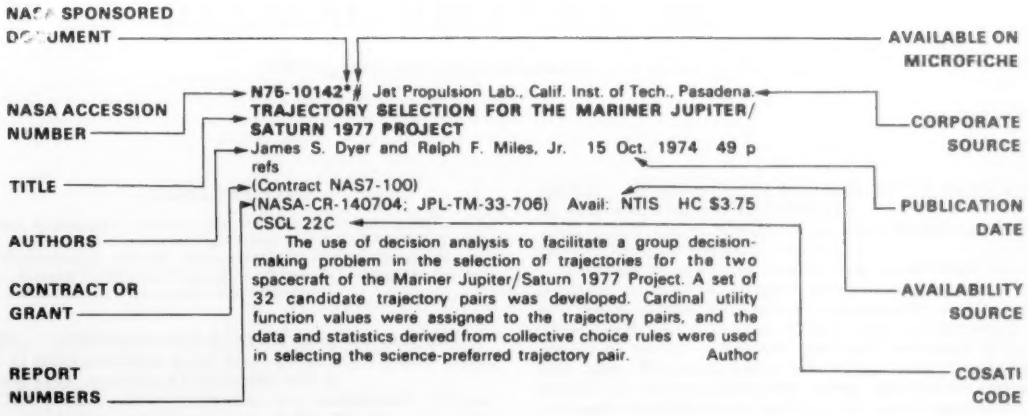
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TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
TITLE
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
PUBLICATION DATE
(Contract NAS7-100)
AUTHORS
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
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The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author
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ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power: Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, PERFORMANCE-EVALUATION, DYNAFLECT
D. POTTER, Australian Road Research Board, *Vermont South, Victoria 3133, Australia* (115393 (HRB NO.))

This project will evaluate structural performance of pavements (including airfields) by use of the Dynaflect Machine. /IRF/

Document provided to S.S.I.E. by the H.R.I.S.

SUPPORTED BY Australian Government - Canberra

1.0002, AIRFRAME RESPONSE DURING GROUND OPERATIONS
H.L. LEVY, McDonnell Douglas Corporation, *Long Beach, California* 90808 (DF134960; F33615-75-C-3079)

The objective of this work is to develop new passive concepts in aircraft landing gear design which overcome the deficiencies in present landing gear of being poor isolators for operations on rough runways during taxi, takeoff and landing roll out. The first objective will be to define the proper gear dynamic characteristics for all modes of ground operation and the second will be to determine landing gear configurations which have the proper dynamic characteristics. Such landing gear will improve airframe fatigue life and will also provide a smoother ride quality during ground operations.

Analyses will be conducted to define the optimum landing gear dynamic characteristics for all ground operational modes. Difficulties may be encountered in accomodating both landing impact and taxi loads since high energy absorption is required during landing impact while for taxi a very soft system is required to isolate dynamic loads to the structure.

Supporting agency address information: AF Flight Dynamics Laboratory FYS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0003, CRITICAL REVIEW STAGNATION POINT HEAT TRANSFER
H. HOSHIZAKI, Lockheed Aircraft Corporation, *Palo Alto, California* 94304 (DF134220; F33615-75-C-3032)

Understanding of the flow fields produced by wind tunnels used for testing models of hypervelocity and re-entry vehicles (e.g., AFFDL re- entry nose tip facility) is required for proper ground simulation. Proper ground simulation of the aerothermodynamic environment experienced by these vehicles will result in improved design and hence, capabilities of future systems. Their development costs will be reduced by reducing the number of flight tests required.

A critical review of existing stagnation point heating theories will be conducted to determine those best suited for application to the AFFDL re-entry nose tip test facility.

Supporting agency address information: AF Flight Dynamics Laboratory FXN, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0004, DEMONSTRATE FEASIBILITY OF MAIN ROTOR BLADE FOR THE H-3 HELICOPTER
UNKNOWN, United Aircraft Corporation, *Stratford, Connecticut* 06497 (DN330030; N00019-73-C-0319)

The use of composite construction in this rotor blade will facilitate advanced aerodynamic geometry in the blade to obtain anticipated improvement in hover performance and increase in cruise speed. Demonstration of such improvement would be as limited by current power and structural limitations of the H-3 helicopter. However, additional performance growth will be possible for future helicopters having appropriate power and structural capabilities and utilizing this type of rotor blade. The knowledge gained from this work will be applicable in general to all future helicopter rotor systems incorporating this type of blade construction.

The blade construction planned involves the use of Sikorsky twin beam rotor concept. This program includes three phases as follows: I. Preliminary design, fabrication and test. II. Detail design and fabrication of full-sized hardware. III. Testing (static and fatigue tests, whirl and flight tests).

Supporting agency address information: Naval Air Systems Command 320N, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0005, INVESTIGATION OF ELECTRO-HYDRAULIC PULSE MOTORS FOR AIRCRAFT UTILITY FUNCTIONS
E. RMPRILL, Lockheed Georgia Company, *Marietta, Georgia* 30060 (DF457380; F33615-75-C-2005)

The advent of airborne digital computers for future aircraft provide for utilization of new control and actuation techniques with potential of providing lighter, less costly and more reliable systems. Electro-hydraulic pulse motors is one of these new techniques that has potential for providing automatic synchronizing, sequencing and positioning of loads that can only be achieved by complex hydromechanical techniques. The objective of this program is to determine and demonstrate the feasibility and applicability of electro- hydraulic pulse motors for controlling and powering aircraft utility systems.

This program will consist of the following phases. 1. Analytical study, 2. Application survey, 3. Design and analysis of a prototype pulse motor actuation system, 4. Prototype fabrication, 5. Component functional test, 6. Iron bird test of prototype, and 7. Durability test of prototype.

Supporting agency address information: AF Aero-propulsion Laboratory POP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0006, ANALYTICAL INVESTIGATIONS OF THE FLOW MECHANISMS IN EJECTORS AND THRUST AUGMENTATION DEVICES
A.L. ADDY, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The performance and noise reduction characteristics of supersonic ejector systems and their application to potential thrust augmentation systems are being studied. The supporting experimental program is directed toward obtaining detailed information on basic flow mechanisms as well as obtaining thrust information for entire systems. The ejector system has the potential to reduce noise levels by favorable interactions between the propulsive noz-

zle and secondary flows. For such systems, the primary concern is to reduce the noise levels and directional characteristics while minimizing degradation of thrust performance.

SUPPORTED BY University of Illinois

1.0007, DEVELOPMENT OF A LOW-DENSITY, HIGH-ENTHALPY, HYPERVELOCITY WIND TUNNEL FOR UNDERGRADUATE INSTRUCTION

H.H. KORST, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

The Departments of Aeronautical and Astronautical Engineering and Mechanical and Industrial Engineering jointly operate a low-density, high-enthalpy hypervelocity wind tunnel which allows continuous operation at Mach numbers up to 12, free stream pressures down to 10 microns, Reynolds numbers of the order 200/inch, and stagnation temperatures up to 6000 degrees Rankine. Nozzle flow fields have been determined and qualitative (glow discharge visualization) and quantitative experimentation is being carried out. Currently, experiments are underway to investigate the drag on spheres in a low- density hypervelocity situation. The facility is also being adapted for the study of low Reynolds number pressure recovery in (strong) boundary layer-shock interactions typical for the supersonic-transonic operation of diffusers in GDL and CHL systems.

SUPPORTED BY University of Illinois

1.0008, EMISSIONS FROM HIGH INLET TEMPERATURE GAS TURBINES

A.M. MELLOR, Purdue University, School of Mechanical Engin., *Lafayette, Indiana* 47907 (801284; 72P00493)

In an experimental facility for basic gas turbine combustor emissions research, detailed internal measurements are made within a combustor so that those zones responsible for the formation and destruction of unburned hydrocarbons, CO, NO, and NO2 can be determined. Thus the influence of combustor design on emissions can be ascertained. Realistic aircraft and automotive gas turbine conditions can both be simulated, and thus both characterization of turbine engine exhaust emissions and development of a better understanding of the processes responsible for emissions in actual combustors can be accomplished under realistic conditions.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

1.0009, MATERIALS AND CONSTRUCTION TECHNIQUES FOR CRYOGENIC WIND TUNNEL FACILITIES

A.T. ROPER, Rose Hulman Inst. of Technol., School of Engineering, *Terre Haute, Indiana* 47803 (NSG 1154; 505-06-42)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0010, AUTOMATED WING STRUCTURAL DESIGN

R.T. HAFTKA, Technion, *Haifa, Israel* (NGR 52-012-008; 743-01-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0011, APPLICATION OF ACOUSTIC EMISSION TECHNIQUES TO HELICOPTER ROTOR SYSTEMS

R.M. RUSNAK, Bendix Corporation, *Southfield, Michigan* 48076 (DA0D3839; DAAJ02-73-C-0066)

Investigate the feasibility of applying acoustic emission techniques to monitor and assess the structural integrity of dynamically loaded helicopter rotor systems, detect, locate and analyze the propagation of fatigue damage therein, and predict the useful life remaining therein following the onset of detectable fatigue damage. An instrumentation system whereby this could be accurately and reliably accomplished would significantly enhance the safety of helicopter flight, as well as simplify and increase the efficiency of inspection and maintenance procedures.

The feasibility study will characterize the acoustic emission signature of several materials and configurations typical of rotor systems, as well as of actual rotor hub and blade components. This will include (1) the acoustic emission signals' attenuation and distortion as a function of these materials and configurations, (2) its transmissibility through, between or across hub-blade attachments or junctures, (3) an analysis of the extraneous noise inherent in the dynamically loaded rotor system such as that imparted by the operating environment and that generated by the relative motion between rotor components in flight, and (4) the identification of means for extracting useful acoustic emission data from the high noise background. Should feasibility be clearly established it will be demonstrated in the laboratory utilizing actual rotor assemblies under simulated dynamic flight loads.

Supporting agency address information: AVCOM Eustis Directorate, Air Mobility R & D Lab., Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0012, PRETHAWING PERMAFROST AND CONSOLIDATION IN PREPARATION FOR CONSTRUCTION

F.E. CRORY, U.S. Army, Cold Reg. Res. & Engin. Lab., *Hanover, New Hampshire* 03755 (DA0J8151)

To develop efficient and economical methods of prethawing permafrost, and establish criteria for preconsolidation and stabilization of such soils to achieve range of bearing capacities applicable to roads, airfields, pipelines and foundations including dams and bridges.

Literature and data from previous related research will be reviewed and analyzed. Theoretical and laboratory studies will be conducted to optimize methods of prethawing, facilitate heat transfer, remove excess pore pressure and consolidate the soils. Field and laboratory studies will be conducted on stabilization, shear strength and bearing capacity of thawed soils, with and without surcharge loadings, and treatment with chemical and cement grouts. The effect of ground temperature on setting time and strength of chemical and cement grouts will be investigated. consideration will be given to prethawing and stabilization for both new construction and existing structures showing distress.

Supporting agency address information: OCE Cold Regions Research and Engineering Laboratory, P. O. Box 282, Hanover, N. H. 03755

SUPPORTED BY U.S. Dept. of Defense - Army

1.0013, RESEARCH ON HELICOPTER ROTOR NOISE 12716-E

A.R. GEORGE, Cornell University, School of Engineering, *Ithaca, New York* 14850 (DA0F5572; DAHC04-75-G-0120)

To develop quantitative understanding of, and methods of analysis for, rotor noise due to random blade loadings and rotor noise due to thickness, acceleration and fluid stresses at high Mach Numbers. Relevance - this research proposal will complement the AMRDL-AMES directorate's research program in rotor blade research. It directly impacts on the current plans and the future direction of helicopter rotor blade noise work at AMRDL-AMES Directorate.

A theoretical analysis for high speed blade slap noise will be carried out based on the Ffowes Williams-Hawkings formulation. A comparative theoretical study of various sources of broadband noise will be made to determine the relative importance of various physical mechanisms which lead to random rotor blade loadings and, hence, to broadband noise.

Supporting agency address information: AMC Army Research Office Box CM, Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

1.0014, PRESSURE CORRELATION BETWEEN WIND TUNNEL AND FLIGHT ON THE X-24B

D.R. SELEGAN, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF132280)

There is a distinct gap in flight research with advanced aerospace vehicles which are designed uniquely for very high speed maneuvering and/or performance. Technology deficiencies are amplified for the aerodynamic designer and the pilot because

these vehicles are required to traverse a multisonic speed regime including hypersonic, supersonic, transonic and subsonic to landing. Specific objective of this effort will be an analysis of the local pressure distributions on this vehicle to isolate the causes for differences between flight results and predicted characteristics with the ultimate objective of better initial vehicle design.

The approach will be mainly empirical. The flight vehicle is instrumented with 254 pressure taps of which 77 can be measured on each flight. During the initial flights, pressure data will be systematically gathered over the total vehicle and Mach range. Once any problem area or discrepancy between flight data and wind tunnel data has been identified, specific pressure tap distributions will be flown to determine the cause of this discrepancy. Finally, a wind tunnel pressure testing is required to complement existing data and match flight data as far as configuration, Mach number and angle of attach is concerned to determine what scaling and design factors are important for this class of vehicle.

Supporting agency address information: AF Flight Dynamics Laboratory FXS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0015, CONTROL OF GLIDING PARACHUTE SYSTEMS
A.E. PEARSON, Brown University, Graduate School, *Providence, Rhode Island* 02912 (DA0F4372; DAAG17-73-C-0172)

Establish the performance of the gliding deceleration in terms of the control requirements and maneuvering capabilities.

The mathematical techniques of optimal control theory are to be applied to the problem of directing the free flight of a gliding parachute through uniform and random wind fields.

Supporting agency address information: TROSCOM Natick Laboratories, Natick, Ms. 01760

SUPPORTED BY U.S. Dept. of Defense - Army

1.0016, SPECIAL FOREIGN CURRENCY AWARD (INCLUDING EGYPTIAN POUNDS) FOR RESEARCH ON COMPRESSOR NOISE AND EFFICIENCY
E. LUMSDAINE, Univ. of Tennessee, School of Engineering, *Knoxville, Tennessee* 37916 (OIP74-21450)

In this cooperative project between the University of Tennessee and Cairo University, the efficiency of rotor or fan blades will be studied in relation to the noise they make. The rotors will be loaded axially, radially, and circumferentially. Experimental rotors, designed from the results of these experiments, will be built and tested. The problem is of theoretical interest and has important implications for aircraft and land-based compressors and turbines in relation to noise-abatement programs.

SUPPORTED BY U.S. Natl. Science Foundation

1.0017, OPTIMIZATION OF STRUCTURES SUBJECT TO AEROELASTIC CONSTRAINTS
R.R. CRAIG, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: A study has been conducted into the application of a gradient projection technique to the minimum-weight design of structures subject to static and aeroelastic constraints. It is proposed that the study be extended to treat more complex structural configurations and additional aerodynamic models.

SUPPORTED BY University of Texas

1.0018, YF-16 AEROELASTIC/ACTIVE CONTROL SYSTEM INTERACTION
R.P. PELOUBET, General Dynamics Corporation, *Fort Worth, Texas* 76101 (DF135030; F33615-75-C-3086)

Aircraft with active control systems can encounter instabilities which result from the interaction of the control system with the aeroelastic response if adequate control system compensation is not provided. The objective of this effort is to develop and substantiate analyses which account for the control system interaction and to correlate with the available flight test data. This effort will establish the confidence and reliability of the analysis procedures. The ultimate payoff will be a reliable method for use early in the design for preventing control induced aeroelastic instabilities thereby eliminating flight restrictions and costly modifications during flight test.

Analyses which include the interaction of the control system with the aeroelastic response will be conducted on the YF-16. These analyses along with previously conducted analyses will be correlated with available flight test results. Technology improvements will be developed and evaluated aimed at improving the correlation between analyses and test results.

Supporting agency address information: AF Flight Dynamics Laboratory FYS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, SYSTEM GENERATED EMP CAVITY FIELDS
R.W. LATHAM, Northrop Corporation, *Hawthorne, California* 90250 (DF181170; F29601-72-C-0089)

To determine the electric and magnetic fields produced near certain idealized geometries by system generated EMP. Of particular interest are geometries resembling satellites.

A set of models are to be defined which are idealized geometries. Two models selected for this effort are two spheres with a hole and a gap respectively. The field excitation is from a single electron with an arbitrary velocity. The source is located close to the spherical geometries. The gap in one sphere is circumferential and there is a known impedance connecting the two hemispheres.

Supporting agency address information: AF Weapons Laboratory ELC, Kirtland AFB, N. Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0002, OPPORTUNITIES FOR RADIO SCIENCE EXPERIMENTS WITH FUTURE NASA SPACECRAFT
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45510; 385-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0003, STUDY FOR ADAPTATION OF TRANSITION RADIATION EXPERIMENT TO SPACELAB SHUTTLE MISSIONS
P. MEYER, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (NAS 5-20967; 356-64-46)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0004, THE EFFECT OF NEGATIVE SURFACE CHARGE ON SATELLITES
H.A. COHEN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245760)

AF function - surveillance or communication satellites. Deficiency - electrical charging of satellites causes failure of on-board electronic components. Objective - development and space flight of a positive ion gun to induce controlled electrical charging. How research contributes - by simulating and controlling satellite charging, the effects on a satellite being charged while in orbit can be determined, and the extent and nature of deleterious effects on electronic equipment can be studied.

A system will be built to enable the controlled ejection of positive ions from a satellite. The system will meet the following specifications: weight less than 10 pounds; beam current greater than 1 milliamp; ion energy greater than 1 kev and an operating lifetime greater than 100 hours. The operational period of the ion source will be determined by ground commands. Using this system either positive ion or neutralized beams will be ejected from the satellite. The system will be used on the SCATHA satellite which will be launched in December 1977.

Supporting agency address information: AF Cambridge Research Laboratories LK, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0005, EXOSPHERIC ELECTRON CONTENT
J.A. KLOBUCHAR, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF245830)

AF function - advanced navigation satellite systems. Deficiency - range errors due to exospheric time delay. Objective - observations and modelling of true time delay above the region above where Faraday data are valid. How research contributes - presently available tec-time delay models do not adequately account for the electrons above the height of Faraday measurement, approximately 2000-4000 kilometers. The electrons above this height will produce additional unaccounted for timing errors, of perhaps 10 to 20 degrees in models used for NAVSTAR-GPS and for satellite detection radars.

Simultaneous measurements of true time delay and of tec-time delay as determined from the Faraday effect are made along the same ionospheric path using signals transmitted from the ATS-6 satellite received at Hamilton, Mass and Huancayo, Peru. The difference in tec- time delay as observed from these two types of measurement will be studied for diurnal, seasonal and solar and magnetic activity dependences and the results will be used to update existing models of time delay. This work unit effort was previously done under IHWU ILIR3B01.

Supporting agency address information: AF Cambridge Research Laboratories LI, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0006, RESEARCH ON CHARGED ALKALI COLLOIDS FOR AEROSPACE VEHICLE AND GROUND BASED POWER GENERATORS
J.L. KERREBROCK, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (DF211900; F33615-69-C-1114)

AF function - advanced aerospace generators (surveillance, aerospace and ground based systems). Deficiency - lack of maintenance- free, long lifetime, self-contained power generators for space vehicles and remote sites. Research - investigations of alkali metal contact ionization charging processes. How research contributes - provides knowledge on electrical charging methods and production of low mobility particles required for advanced electrofluid dynamic (EFD) energy conversion processes. Thermodynamic considerations indicate that it is advantageous to use condensing alkali metal amalgam vapors as the primary working medium whereby contact ionization processes become feasible as the electrical charging process. Theoretical and experimental studies are being made into the basic physical properties of a colloidal, electrically charged suspension of cesium amalgam produced by expansion of contact-ionized vapor into a lightweight cooling gas, and the incorporation of such suspensions into electrofluid dynamic generators. Knowledge gained from this work will be incorporated into future research which may lead to advanced EFD generators with higher efficiency and higher power density characteristics and therefore suitable for more varied applications.

Supporting agency address information: Aerospace Research Laboratory LE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

2.0007, NAVIGATION MODEL FOR ATS SATELLITES
V.E. SUOMI, Univ. of Wisconsin, School of Natural Sciences, *Madison, Wisconsin* 53706 (NAS 5-20974; 175-51-45)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, ELECTRONIC BEAM SURFACE ANALYSIS OF INORGANIC AND ORGANIC MATERIALS
UNKNOWN, Univ. of California, Graduate School, *Berkeley, California* 94720 (NCA 2-50501; 502-01-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0002, ELECTRON BEAM SURFACE ANALYSIS
UNKNOWN, Univ. of California, Graduate School, *Berkeley, California* 94720 (NCA 2-50601; 506-16-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0003, INFRARED SPECTROSCOPY OF WATER VAPOR AT ATMOSPHERIC AND ELEVATED TEMPERATURES
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45517; 506-26-21)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0004, ANGSTROM-PARTICLE CATALYSIS
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45511; 506-16-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0005, STUDY OF INTERMETALLIC COMPOUNDS
J. MILLER, United Aircraft Corporation, *West Palm Beach, Florida* 33402 (DF214940; F33615-75-C-1166)

AF function - advanced aerospace vehicles. Deficiency - reliability of structural materials at high temperatures. Research - understand and exploit titanium aluminides. How research contributes - phase relationships, alloying behavior, and mechanical and physical property studies are necessary to allow more exact design with consideration of a wider range of operating conditions. If more room temperature ductility can be introduced in Ti sub 3 Al or TiAl, a whole new class of materials may become available to the Air Force.

This program will attempt to improve room temperature ductility by alloying and/or heat treatment.

Supporting agency address information: Aerospace Research Laboratory II, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0006, THE EFFECT OF A ZERO G ENVIRONMENT ON FLAMMABILITY LIMITS AS DETERMINED USING A STANDARD FLAMMABILITY APPARATUS
R.A. STREHLOW, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (NSG 3043; 750-01-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0007, COMPOSITE PRIMARY AIRCRAFT STRUCTURES
H.W. SMITH, Univ. of Kansas, Center For Res. Incorporated, *Lawrence, Kansas* 66044 (OIP75-06046)

Basic research on the properties of fiber reinforced composite materials will be accomplished in this project. Experimental and theoretical work to be carried out, is an element of a long range project to be conducted jointly by the Institute Tecnologico de Aeronautica, Sao Jose dos Campos, Brasil and the University of Kansas. The Brazilian goal is to design, analyze, build, test and fly airplanes constructed with fiber reinforced primary structural components. Goals for the University of Kansas in the cooperative venture are the establishment of theoretical and laboratory capabilities to perform critical materials research investigations.

Tension, shear and bending specimens will be instrumented and loaded. Experimental strain and deflection data will be compared to existing and newly developed theoretical expressions.

SUPPORTED BY U.S. Natl. Science Foundation

3.0008, EVALUATION OF AQUEOUS FILM FORMING FOAM (AFFF) FOR FIRE PROTECTION IN AIRCRAFT HANGARS
UNKNOWN, Factory Mutual Research Corp., *Norwood, Massachusetts* 02062 (DN492010; N00025-73-C-0031)

Determine the effectiveness of using aqueous film-forming foams (AFFF) as fire suppressants in the protection of large fuel fires in aircraft hangars.

Evaluate alternative agents of AFFF for effectiveness and interchangeability in primary and supplementary systems; test nozzles adaptable to AFFF deluge systems use and perform large-scale fire tests with most promising model(s); test ground-level AFFF discharge devices, of both oscillating and fixed designs, at various pressures; and, investigate interaction of such devices with water deluge systems in large scale tests.

Supporting agency address information: Naval Facilities Eng. Command 032D, Alexandria, Va. 22332

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0009, STRUCTURE PROPERTIES OF GRAPHITE FIBER-COMPOSITES
UNKNOWN, Univ. of Missouri, Graduate School, *Rolla, Missouri* 65401 (NCA 2-50501; 506-16-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0010, STABILITY OF NEW TRANSPARENT POLYMERIC MATERIALS
UNKNOWN, Polytechnic Inst. of New York, Graduate School, *Brooklyn, New York* 11201 (NCA 2-95501; 501-21-22)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0011, CATALYTIC EFFECTS OF TRANSITION METALS ON THE COMBUSTION OF HYDROCARBONS, AND THE PRODUCTION OF NOX
S.H. BAUER, Cornell University, School of Physical Sciences, *Ithaca, New York* 14850 (MPS75-04120)

Using the laser-Schlieren method in shock tube research and a differential single pulsed shock tube, the role of metal atoms in controlling ignition delay times in hydrocarbon combustion and the catalytic effects of metals on the intermediate and later stages of combustion are being ascertained. In addition, the role of metals in controlling the degree to which oxides of nitrogen generated during the high temperature phase of hydrocarbon/oxygen explosions are reconverted to nitrogen and carbon monoxide by the incompletely combusted hydrocarbons during the lower temperature regime, and why small amounts of nitrogen oxides reduce ignition delay times in hydrocarbon combustion are being examined. The general objective of this work is to develop a mechanism for the catalytic effects of metals on initiation and combustion processes in hydrocarbons, and on the control of nitrogen oxides from combustion chambers.

SUPPORTED BY U.S. Natl. Science Foundation

3.0012, COMBUSTION OF POROUS SOLIDS AT REDUCED GRAVITATIONAL CONDITIONS
A.L. BERLAD, State University of New York, School of Engineering, *Stony Brook, New York* 11790 (NSG 3051; 750-01-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0013, DEFINITION OF PERFORMANCE SPECIFICATIONS FOR AUTOMATED ANALYTICAL ELECTROPHORESIS FACILITY
D.E. BROOKS, Univ. of Oregon, Graduate School, *Eugene, Oregon* 97403 (NAS 8-31386; 179-42-20)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0014, MICROPROBE AND OXYGEN FUGACITY STUDY OF ARMALCOLITE
J.J. FRIEL, Univ. of Pennsylvania, Graduate School, *Philadelphia, Pennsylvania* 19101 (NSG 7119; 195-20-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0015, EVALUATION OF THE MECHANICAL PROPERTIES OF ELECTRIC-SLAG REFINED IRON ALLOYS
UNKNOWN, Carnegie Mellon University, Graduate School, *Pittsburgh, Pennsylvania* 15213 (NAS 3-18929; 502-01-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0016, POSITRON ANNIHILATION STUDIES OF DEFECTS IN SOLIDS
J.G. BYRNE, Univ. of Utah, School of Engineering, *Salt Lake City, Utah* 84112 (DF040820; AF-AFOSR-2810-75)

Nondestructive evaluation (NDE) of materials before and during service saves the Air Force many lives and millions of dollars annually. Structural (airframe) and high performance (turbine engine) materials must be inspected periodically and evaluated to determine their continued use or need for replacement. Many critical defects such as metal fatigue and small cracks are impossible to evaluate with current NDE techniques. This research seeks to develop a new technique, positron annihilation, to inspect small internal defects in metals. Doppler broadening of the annihilation radiation will be studied instead of the angular correlation or lifetime measurements which require coincidence circuitry and larger, less portable, experimental equipment. Doppler broadening requires only a single detector and may be performed at much higher counting rates than the other techniques. Initial studies will examine the role of edge dislocations in trapping positrons. Separation of traps from other imperfections such as grain boundaries, micro- cracks, impurities, screw dislocations etc. must be made.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0017, PROGRAM TO SIMULATE RAMAN SCATTERING SPECTRA OF SUPER COMBUSTION PRODUCED FLOWS
A.R. BANDY, Old Dominion University, School of Science, *Norfolk, Virginia* 23508 (NAS 1-13820; 505-05-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0018, CERAMIC AIRFRAME BEARINGS
J.W. VANWYK, Boeing Company, *Seattle, Washington* 98108 (DN330004; N00019-75-C-0170)

To explore the feasibility of using ceramics to expand the capability and service life of airframe bearings.

Available ceramics and solid lubricants will be evaluated. The most promising will be incorporated into bearings designed to capitalize on and/or compensate for various ceramics properties.

Supporting agency address information: Naval Air Systems Command, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, REDUCTION AND ANALYSIS OF DATA FROM AN INTEGRATING TV SYSTEM
T.D. FAY, Univ. of Alabama, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-31343; 188-41-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0002, NONEQUILIBRIUM EFFECTS IN NOZZLES AND EXHAUST PLUMES
M.C. BRANCH, Univ. of California, School of Engineering, *Berkeley, California* 94720 (DF037280; AF-AFOSR-2560-73)

This program supports AFRPL, AFAPL, and AFATL needs through the analytical examination of aircraft and rocket plume properties. Also, it relates directly to the evaluation of chemical perturbations of the atmosphere by aircraft engine effluents. Considerable attention is currently focused on possible influence of these combustion products on modification of climatic or environmental conditions at lower elevations. Exhaust gas elements have a range of temperature-time histories depending on their location within the exhaust jet. In addition, because of entrainment of air into the turbulent exhaust jet, dilution effects have similar spatial variations. Earlier jet exhaust studies have not included these boundary layer effects together with chemical nonequilibrium effects for jet aircraft flight. In the present study a solution is sought for the boundary layer equations for turbulent mixing of a high temperature exhaust jet with a surrounding stream including finite rate chemistry. Presently available finite difference techniques for solution of the steady boundary layer equations for momentum, mass, and energy are to be extended to include reaction kinetics. The flowfield to be considered is parabolic and two dimensional. The kinetics of stable and radical species will be included in examining spatial variations of species concentrations.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0003, STUDY OF THE CORKSCREW EFFECT IN LASER PROPAGATION
M.W. MUNN, Lockheed Aircraft Corporation, *Palo Alto, California* 94304 (DF040840; F44620-75-C-0062)

The intensity profile of a high energy laser beam propagating through the atmosphere can be altered by density changes (refractive index changes) in the air caused by heating of the air by the beam. In the past, this non-linear heating problem has been solved assuming a constant magnitude and direction for the transverse air flow through the beam. In actuality, the flow velocity is the vector sum of the wind velocity and the flow due to the slewing of the beam through the air. In a coordinate system fixed within the beam, the magnitude and direction of the transverse flow velocity will vary with time producing time dependent changes in both the density and refractive index (corkscrew effect). The objective of this study is to provide a solution of the time dependent hydrodynamic flow equations for laser heating in two dimensions and allowing for both the magnitude of the wind velocity projection and its direction to vary with time. These variations will be defined in terms of slew rates, wind velocities, and beam, on times encountered in typical engagement scenarios. The principal objective will be to specify density contours and related refractive index contours within the beam as a function of time. This will allow an assessment of the importance of the corkscrew effect in laser propagation as compared with conventional steady state thermal blooming phenomena.

Supporting agency address information: AF Office of Scientific Research NPP, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0004, RESEARCH IN BIOMEDICAL INSTRUMENTATION
R.K. PEFLEY, Univ. of Santa Clara, School of Engineering, *Santa Clara, California* 95053 (NCA 2-85501; 970-23-30)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0005, DEVELOPMENT OF IMPROVED DESIGN METHODS FOR DIGITAL FILTERING SYSTEMS
T.A. BRUBAKER, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (DF100770; F33615-75-C-1138)

To develop improved design methods for linear digital control algorithms which are applicable to digital avionics systems, to evaluate these improved design methods in comparison with conventional design procedures such as Tustin's method, and to develop interactive software to aid in the design and implementation of digital control algorithms.

This program will modify Tustin's method to include the sampling interval as a design parameter. Constraining the algorithm coefficients to eliminate or minimize the requirement for digital multiplication leads to algorithms that are simple to implement and thus more reliable. Interactive software will be developed and delivered to aid in the design and implementation of digital control algorithms.

Supporting agency address information: AF Avionics Laboratory AAA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0006, ADVANCED AIRBORNE SENSORS USING ACOUSTIC SURFACE WAVES
T. REEDER, United Aircraft Corporation, *Hartford, Connecticut* 06118 (DN590038; N00019-75-C-0365)

The objective of this program is to demonstrate that surface acoustic wave sensors can be built in standard temperature and pressure measurement ranges with important advantages in digital processing compatibility, very small size and weight, rugged construction and low power consumption. This program will ultimately lead to the development of a family of digital sensors for the measurement of altitude, acceleration, strain, fluid flow, and engine thrust.

Analysis of surface acoustic wave propagation on diaphragm devices will be performed with the goal of establishing an engineering design model for temperature and pressure sensors using the diaphragm configuration. A saw temperature sensor will be designed and tested for operation over the 20 to 200 degrees C range. Saw pressure and tested over the 0 to 15 psi range.

Supporting agency address information: Naval Air Systems Command, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0007, OPERATION OF A SCIENTIFIC COMMUNICATION SYSTEM FOR PLANETARY QUARANTINE
UNKNOWN, George Washington University, Graduate School, *Washington, District of Columbia* 20006 (NASW 2768; 193-58-63)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0008, DESIGN OF THREE-METER APERTURE INFRARED TELESCOPE FACILITY
J.T. JEFFERIES, Univ. of Hawaii, School of Arts, *Honolulu, Hawaii* 96822 (NASW 2742; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0009, INVESTIGATION OF FACTORS INFLUENCING ANNULAR BASE DRAG OF BODIES OF REVOLUTION WITH JET FLOW IN TRANSONIC & SUPERSONIC EXTERNAL STREAMS
A.L. ADDY, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

A theoretical and experimental investigation of the afterbody and base drag characteristics of propulsion systems under simulated transonic and supersonic flight conditions is being conducted. Factors of special interest are scaling effects, influence of thermodynamic properties of the propellants, combustion effects, and plume-induced separation. System studies are being carried out over a wide range of geometrical configurations and simu-

lated free-flight operating conditions to optimize and evaluate overall system drag. Experimental phases of this program are being conducted in a specially developed annular wind tunnel.

SUPPORTED BY University of Illinois

4.0010, NONEQUILIBRIUM THERMODYNAMICS AND FLUID DYNAMICS
S.L. SOO, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

Basic formulations of nonequilibrium thermodynamics and fluid dynamics include different mass velocities, static temperatures, and energy states of components of a mixture. A determination was made of the transport properties of a component in a mixture, relaxation times for momentum and energy exchange, and mutual diffusion coefficients. Mathematical solutions of basic equations are being studied. General relations are applicable to the class of problems of diffusion under the influence of field forces.

SUPPORTED BY University of Illinois

4.0011, RAREFIED GAS DYNAMICS
S.M. YEN, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

A numerical method of solving directly the nonlinear Boltzmann equation, the basic equation of kinetic theory, is being used to find solutions of several problems of gaseous systems far from thermal equilibrium. We have developed further our numerical method so that it can be applied to more complex problems. We have recently solved a problem related to low density free-jet wind tunnel. We are solving shock wave and heat transfer problems for binary gas mixtures.

SUPPORTED BY University of Illinois

4.0012, QUALITATIVE ANALYSIS OF LARGE-SCALE DYNAMICAL SYSTEMS
A.N. MICHEL, Iowa State University, School of Engineering, *Ames, Iowa* 50010 (ENG75-14093)

The research is in the area of qualitative analysis of large-scale dynamical systems. Deterministic as well as stochastic dynamical systems of finite and infinite dimension will be considered. Items of primary interest will be Lyapunov stability, input-output stability, Lagrange stability and estimates of trajectory behavior and trajectory bounds. The results to be developed will be in such form as to make synthesis and compensation procedures for certain classes of interconnected systems feasible. Existing results as well as those to be developed will be applied to two broad categories of large-scale systems: (a) traditional systems encountered in technology, such as those arising in circuit theory, aerospace systems, power systems, and the like; (b) competitive (or cooperative) systems, such as economic systems, societal systems, biological systems, ecological systems, and others. Special attention will be given to systems with complex interconnecting structure.

SUPPORTED BY U.S. Natl. Science Foundation

4.0013, EARTH OBSERVATION RADAR CONCEPT STUDY
R.K. MOORE, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NAS 5-22325; 644-03-10)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0014, FAILURE MECHANISM AND LIFE - CYCLE REDUCTION OF AEROSPACE NICKEL - CADMIUM CELLS (ABBREV)
P.P. MCDERMOTT, Coppin State College, Undergraduate School, *Baltimore, Maryland* 21216 (NSG 5051; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0015, ULTRASONIC LEVEL GAUGES
C. COLEMAN, U.S. Army, Harry Diamond Laboratories, *Hyattsville, Maryland* 20783 (DA0E5723)

Develop liquid level metering technique for use in explosive environment such as oil tankers, fuel tanks for aircrafts and others with very high resolution (10 mm) capability.

Electrical wave propagation methods suffer from insufficient range resolution. Therefore, acoustic methods will be exploited. Two approaches are taken. The first uses air as a medium and the other uses a steel wire with a roller-float mechanism.

Supporting agency address information: AMC Harry Diamond Laboratories, AMXDO-RAA 2800 Powder Mill Rd., Adelphi, Md. 20783

SUPPORTED BY U.S. Dept. of Defense - Army

4.0016, SLED TEST - SLED RUN SUPPORT
R.C. RETHMEL, U.S. Air Force, Test Track Division, *Holloman Air Force Base, New Mexico* 88330 (DF418095)

Test runs continue to provide data to support space time interruptor surveys, development of new analysis programs, and new equipment checkout. Progress has been satisfactory. Development of new sled forebodies underway. Reporting period: Aug 73 to Jul 74.

Obtain the track division's support in performing R D testing on the high speed test track.

Supporting agency address information: 6585 Test Group Guidance Division, Holloman AFB, N.M. 88330

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0017, 100 MICRON DETECTOR DEVELOPMENT PROGRAM
J.R. HOUCK, Cornell University, School of Arts, *Ithaca, New York* 14850 (NAS 2-8706; 352-02-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0018, TWO-PHASE THERMAL CONVECTION IN A POROUS MEDIUM
D.L. TURCOTTE, Cornell University, School of Engineering, *Ithaca, New York* 14850 (ENG75-14596)

Integrated numerical and experimental studies of two-phase thermal convection in a porous medium will be carried out for a water-steam system. Time-dependent, two-dimensional numerical calculations will be undertaken for a porous layer confined by two horizontal boundaries. Two boundary-value problems will be examined: impermeable, isothermal boundaries, and an upper, permeable boundary. The effect of a depth- dependent permeability will be examined. Preliminary calculations will consider a single-phase fluid. Extension to liquid-liquid phase changes and to liquid-vapor phase changes will be carried out. Experiments will be conducted on a 1 m x 1 m x 0.2 m chamber filled with graded sand and water. Electric, radiant heating will be supplied to the base. Perforation of the upper boundary will simulate a permeable surface. Temperatures will be monitored with a thermocouple grid. Heat flux measurements on the boundaries and interior pressure measurements will be obtained. The objective of the study is to develop a basic understanding of flow processes, and to identify the relative roles of steady and unsteady convection, the extent to which two phases coexist, and the influence of parameter variations. Applications of the results include chemical process industries, heating and air-conditioning, combustion-fired boilers, turbojet and rocket combustors and nozzles, and the nuclear power industry.

SUPPORTED BY U.S. Natl. Science Foundation

4.0019, MULTISPECTRAL PHOTOGRAPHIC REMOTE SENSING SYSTEM TO EXPEDITE DETECTION OF TREE STRESS IN URBAN ENVIRONMENTS
T.M. LILLISAND, State University of New York, School of Forestry, *Syracuse, New York* 12224 (0066320; NYZ-113-0-003)

OBJECTIVE: Quantify changes in the photometric and geometric properties of selected species in response to stress

mechanisms typical of urban environments; develop and test a photographic remote sensing data acquisition and analysis system which would permit expeditious detection of stress for the species/stress mechanisms studied above; delineate mechanisms by which the above detection system might be integrated into the urban tree cover inventory and maintenance process on a regional basis.

APPROACH: Laboratory investigation of the photometric and geometric response of trees to controlled sources of stress will be used to design an aerial photographic stress detection system. Photographic effects (film processing, atmospheric attenuation, etc.) precluding remote stress detection will be negated through sensitometric film control and analysis. Close range photogrammetry, laboratory spectroradiometry, multispectral aerial photography and semi-automated electronic image analysis will be employed.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

4.0020, CONVECTION PHENOMENA AT REDUCED GRAVITY
S. OSTRACH, Case Western Reserve Univ., Graduate School, *Cleveland, Ohio* 44106 (NSG 3053; 750-01-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0021, STIMULATED ANTI-STOKES RADIATION IN GASES
R.B. WON, Systems Research Labs. Inc., *Dayton, Ohio* 45432 (DF214990; F33615-75-C-1116)

AF function - laser development, combustion studies, compressor studies, chemical emissions, aerodynamic testing. Deficiency - on-site methods are needed to determine temporally and spatially resolved species concentrations in reacting and nonreacting flows. Research - development of an experimental and theoretical base for the applications of stimulated anti-Stokes spectroscopy to the measurement of species concentrations in plasma and gases. How research contributes - a recent experimental test at Onera, France showed that stimulated anti-Stokes radiation can be used to measure the density of molecular hydrogen in reacting flows. The intensity of this radiation was many orders of magnitude greater than the radiation produced by ordinary Raman scattering. This new approach will be investigated and extended to include other molecules of interest to the Air Force.

The measurements at Onera were restricted to H sub 2 because the high intensity Stokes radiation was generated in high pressure hydrogen cells. To extend the method to other species, high power, tunable lasers will be used to generate the Stokes beam at the required frequency for given molecular species. Several systems will be designed based on available pump and tunable lasers. An assessment will be made of the applicability of these systems to current Air Force research and development programs. Coordination of this program has been made with other AFSC laboratories. The Plasma Physics Laboratory, ARL and AFAPL plan a joint effort applying these research results in FY76.

Supporting agency address information: Aerospace Research Laboratory LU, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0022, RESEARCH INITIATION - RESEARCH IN THE THEORY OF OPTIMUM MECHANISM DESIGN
S.N. KRAMER, Univ. of Toledo, School of Engineering, *Toledo, Ohio* 43606 (ENG75-11303)

The newly developed Selective Precision Synthesis technique (SPS) is a method of synthesis which allows a mechanism designer to selectively choose the precision required at various positions of the mechanism cycle.

The aim of this research program is to extend and refine the SPS technique by incorporating the following developments: 1. Extension of the SPS technique to include synthesis of spatial mechanisms which can be constructed from dyads. Such spatial mechanisms in common use include: prosthetic and orthotic mechanisms, mechanical manipulators, space-craft solar panels, automobile steering and suspension mechanisms, door and trunk lid hinges, aircraft flap deployment mechanisms, toys, agricultural machines, and others. 2. Extension of the SPS technique to include infinitesimally separated positions. 3. Incorporation into the SPS technique of systematic means of determining which of the several optimal dyads determined should be connected to form mechanisms, since some combinations perform better than others. 4. Include additional kinematic requirements such as manufacturing cost, limitations on extreme positions and pin-joint clearances. 5. Include several dynamic and elasto-dynamic design requirements such as inertia force and torque limitations, link deflections, stress and mass limitations. The possibility of including several of these concepts into the objective function will be investigated.

SUPPORTED BY U.S. Natl. Science Foundation

4.0023, LARGE EDDY STRUCTURE OF A TURBULENT BOUNDARY LAYER
F.R. PAYNE, Univ. of Texas, Graduate School, *Arlington, Texas* 76010 (NSG 2077; 506-26-22)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0024, SHUTTLE LEE-SIDE HEAT TRANSFER MEASUREMENTS
J.J. BERTIN, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: Experimental data obtained in the Calspan Hypersonic Shock Tunnel are being analyzed to determine how the nonadiabatic character of the windward flow-field affects the heat transfer to the leeward surface. The parameters under consideration are the free-stream Mach number, the free-stream Reynolds number, and the ratio of wall temperature (both windward and leeward) to total temperature. Emphasis is placed on obtaining correlation parameters which can be used for extrapolation to flight conditions.

SUPPORTED BY Calspan Corporation - Buffalo, N.Y.

4.0025, CONFIGURATIONS
R.K. CAVIN, Texas A & M University System, School of Engineering, *College Station, Texas* 77843 (NAS 9-14478; 986-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, WATER RESOURCES AND STREAM CONTAMINATION STUDY
L. DOYLE, Univ. of Alabama, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-31345; 176-53-71)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0002, FEASIBILITY OF REMOTE SENSING IN RANGE EVALUATION AND DETERMINATION OF SEASONAL CARIBOU DISTRIBUTION IN NORTHEAST ALASKA
A. LAPERRIERE, Univ. of Alaska, State Coop. Wildlife Res. Unit, *Fairbanks, Alaska* 99701

To develop methods of caribou range evaluation using aerial photography; to determine seasonal distribution and movements of caribou in NE Alaska, to determine feasibility of using ERTS imagery in habitat evaluation and detection of caribou herds.

SUPPORTED BY University of Alaska

5.0003, ANALYSIS OF ERTS DATA FOLLOW-ON INVESTIGATION
W.J. STRINGER, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (NAS 5-20959; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0004, EFFECT OF AMBIENT CONDITIONS IN AIRCRAFT ENGINE EMISSIONS - TASK I
P.E. MATUSCHAK, Garrett Corporation, *Phoenix, Arizona* 85034 (68-03-2156)

Objective: To determine the effects of ambient temperature, humidity, and pressure on the emissions of hydrocarbons, carbon monoxide, smoke, and oxides of nitrogen from aircraft gas turbine engines.

Approach: The study will be eight (8) months in duration. Emission measurements are to be conducted utilizing the instruments and measurement procedures specified in the Federal register of July 17, 1973; Pages 19083 through 19103. Turboprop engines with 500 - 1,000 equivalent shaft horsepower and auxiliary power units with 200 - 350 equivalent shaft horsepower will be used for testing.

Current plans: The final results of this study will be the specification of the dependence of emissions of carbon monoxide, unburned hydrocarbons, smoke, and oxides of nitrogen from aircraft engines on inlet air temperature, humidity, and pressure.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0005, DEVELOPMENT OF METHODOLOGY FOR CHARACTERISTICS OF EMISSIONS FROM AIRCRAFT SOURCES
PEEBLES, Garrett Corporation, *Phoenix, Arizona* 85034 (68-02-1236; 72P21639)

The objective of the program is to establish methods for estimating the mass of insoluble particulate emissions from aircraft gas turbine exhaust flows as they exist in the open atmosphere. In order to achieve this objective, sampling devices and instruments will be used to establish optimum representative sampling parameters. Development of a reliable, accurate, and simple gravimetric procedure will be emphasized during the program. The Airesearch Engine Model TPE331 turboprop engine will be tested at four power settings to obtain engine emission characteristics for unburned hydrocarbons, oxides of nitrogen, carbon monoxide, and particulates. At each power setting, four sample flow rates and up to four different approved filter materials will be used to obtain the conventional smoke numbers and an estimate of the mass particulate emissions. A preferred filter material will then be selected, and the engine tailpipe exhaust will be mapped in detail with the use of gravimeter and reflectometer measurements at various power settings. A detailed analysis will be made to consider the manner in which the variable parameters involved in the gravimetric smoke measurements may be experimentally optimized. Consideration will also be given to accuracy and reproducibility of results, as well as to overall costs and minimizing special requirements and test time.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0006, MEASURING OZONE IN AIR
R. SCHOTTLAND, Univ. of Arizona, Inst. of Atmospheric Physics, *Tucson, Arizona* 85721 (DN575147; N00014-75-C-0740)

The aim of this research is to develop a remote sensing technique for the observation of ozone change in the lower atmosphere with the eventual objective of extending the technique to monitoring stratospheric ozone. The technique to be developed will apply both as a research tool for the study of cloud dynamics and as a means of measuring the impact of naval operations upon the environment.

Available laser technology will be employed to put together a tunable dye laser to observe ozone by an absorption spectroscopy technique in the neighborhood of 3,000 angstroms. The instrumentation will first be used to look up from the ground to cloud top heights of about 13 km to monitor ozone changes around clouds and thunderstorms. It will later be mounted in an aircraft to monitor ozone in the lower levels of the atmosphere using the ground as a reflecting surface.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

5.0007, REMOTE MEASUREMENT OF AIR POLLUTANTS
E.K. PROCTOR, Stanford Research Institute, *Menlo Park, California* 94025 (AEN73-10596 A01)

This joint research effort by Stanford University and Stanford Research Institute will investigate the feasibility of remote air pollution measurements using the differential absorption technique with a tunable lidar. This tunable laser radar will be capable of making range-resolved measurements, out to ranges of the order 5 to 10 km, of ambient concentrations of several of the most important air pollutants. Such an instrumental capability will enable studies to be made of vertical profiles of pollutant distributions, horizontal and vertical dispersal and removal rates, the behavior of pollutants as a function of distance downwind from fixed sources, and photochemical conversion rates. It will also provide a prototype of an instrument useful for monitoring air quality over a large urban area from a single observation point and for studying the relationships between air quality and various control strategies.

SUPPORTED BY U.S. Natl. Science Foundation

5.0008, MONITORING OF POLLUTANT GASES IN AIRCRAFT BY GAS FILTER CORRELATION METHODS
D. GRYVENAK, Philco Ford Corporation, *Newport Beach, California* 92663 (DF457780; F33615-75-C-2038)

A Gas filter spectrometer (GFC) was designed and built by Philco- ford for EPA. It was designed for measuring gaseous emissions in smoke stacks. This program shall investigate the applicability of this spectrometer for making in situ measurements of jet engine exhaust emissions.

The evaluation tests will be performed at the AF Aero-Propulsion Laboratory (AFAPL). A T56 combustor rig will be used to simulate the exhaust profiles of different types of jet engines. Exhaust species concentration measurements shall be performed with GFC spectrometer and the results compared with sampling probe measurements.

Supporting agency address information: AF Aero-Propulsion Laboratory SFF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0009, NUMERICAL ANALYSIS OF GENERAL CIRCULATION OF STRATOSPHERE
J.R. SPREITER, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2072; 989-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0010, SEISMOTECTONIC STUDIES OF AREAS OF MAJOR WORLD-WIDE EARTHQUAKES UTILIZING ERTS IMAGES
C.R. ALLEN, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (NSG 5058; 161-01-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0011, ERTS DATA FOLLOW-ON INVESTIGATION
J.D. IVES, Univ. of Colorado, School of Arts, *Boulder, Colorado* 80304 (NAS 5-20914; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0012, TURBULENCE MODEL - STATISTICAL SIMULATION
C.B. WINN, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (NAS 8-31237; 989-13-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0013, INVESTIGATION OF AERODYNAMIC PHENOMENA
L.J. SPADACCINI, United Aircraft Corporation, *Hartford, Connecticut* 06118 (68-02-1873)

The research program will investigate aerodynamic phenomena in the control of pollutants from gaseous and heterogeneous combustion. The program has four primary objectives: (1) To utilize recently developed optical and probing techniques to obtain detailed information on the chemical and physical processes occuring inside a combustor operating on gaseous and liquid fuels. (2) To compare experimental observations with results from a combustor flow analysis (FREP code) to further evaluate the theoretical model. (3) To further develop the combustor flow analysis for predicting the physical and chemical processes occurring in combustors operating on gaseous and liquid fuels. (4) To utilize information obtained from the experimental and theoretical investigation to evaluate potential emission control strategies for gaseous and liquid fuel combustors.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0014, MODELING ASPECTS OF CIAP OF DOT
M. MACCRAKEN, U.S. Energy Res. & Dev. Admin., *Washington, District of Columbia* 20545 (WBS-220-1,WBS-230-1; 036965 (TRAIS NO.))

Determine the importance of photochemistry occurring at this scale of motion: Determine ratio of maximum to average concentration ratios in regions of heavily traveled flight routes. Provide initial pollutant concentrations for global circulation models.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0015, ELECTROMAGNETIC WAVE ENERGY CONVERSION RESEARCH
R.L. BAILEY, Univ. of Florida, School of Engineering, *Gainesville, Florida* 32601 (NSG 5061; 506-23-18)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0016, MEASURE OF RADIO METEOR WINDS
R.G. ROPER, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332 (DES75-14414)

This program will place on a routine basis the measurement of winds in the mesosphere. These results will be compared with the predefined models now being developed in several laboratories in the country.

SUPPORTED BY U.S. Natl. Science Foundation

5.0017, PLANETARY THERMAL CIRCULATIONS OF THE ATMOSPHERE
H.L. KUO, Univ. of Chicago, Graduate School, *Chicago, Illinois* 60637 (DES75-05219)

The main objectives of this research are the continuation and extension of theoretical investigations on the thermally controlled circulations in the atmosphere, which at the present time include the following: 1) The origin and structure of the tropospheric and stratospheric disturbances in the tropics. 2) The combined influences of latent heat and baroclinity on wave disturbances in low latitude. 3) Thermal convection in the surface layer. 4) The influence of boundary layer flow on equatorial waves. Work on 1, 3 and 4 are well underway, and it is expected that all of them will be finished during the first year under this grant. Work on problem 2 will also start during the first year, while during the second year work will start on the monsoon problem discussed in section C(2).

The new Cisk model to be used in the approach to problem 1 assumes that the amount of moisture available to a regular wave is proportional to the period tau of the wave when tau is shorter than a limiting period. This model prevents the regular short period gravity waves from being excited by the latent heat alone. Influence of the boundary layer flow is also included in 1, while more detailed boundary layer flow is treated in problem 4.

Problem 3 is concerned with the diurnal changes of the thermal convection in the lower atmosphere and is attacked by the use of a simple model.

SUPPORTED BY U.S. Natl. Science Foundation

5.0018, A DIAGNOSTIC STUDY OF CUMULUS CLOUD POPULATIONS
Y. OGURA, Univ. of Illinois, Graduate School, *Urbana, Illinois* 61801 (OCD73-00238 A01)

The objectives of this proposal are: (a) to develop a method whereby some properties of cumulus cloud populations can be determined diagnostically from observed large-scale variables, and (b) to develop a simple one-dimensional cloud model tailored for such a study in a way that the most relevant cloud variables can be predicted. These cloud variables include the vertical mass flux (therefore rates of entrainment and detrainment), excess temperature, water vapor mixing ratio and liquid water content inside the cloud. The data from the projected GATE B-scale network, including satellite images and radar data, will be most valuable for this study.

SUPPORTED BY U.S. Natl. Science Foundation

5.0019, ANALYSIS OF DATA FOR ERTS FOLLOW-ON INVESTIGATION
M.E. BAJER, Purdue University, Graduate School, *Lafayette, Indiana* 47907 (NAS 5-20793; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0020, PREDICTION OF WHEAT YIELD
A.M. FEYERHERM, Kansas State University, School of Arts, *Manhattan, Kansas* 66502 (NAS 9-14533; 658-10-20)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0021, IONOSPHERE MAGNETOSPHERE INTERACTIONS
J.A. WHALEN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF244690)

AF function - transpolar communication, radar and navigation. Deficiency - the polar ionosphere is presently very unpredictable to such a degree that the above functions are frequently degraded or crippled. Research - to define the high latitude ionospheric environment and its impact on AF systems. How research contributes - the high latitude ionospheric environment affects AF ground, airborne, and satellite communications, radar and navigation systems. The specific range objective (FY75) is more accurate specification of ionospheric parameters for AWS and their customers - OTH radar SPO's communication satellite SPO's, survivable communications, DMSS and GPS. The long-range contribution will be to assist the complete theoretical understanding of the complex magnetospheric interactions ultimately necessary for reliable operation of the above functions.

A study and report on scientific results using airborne, satellite and ground station data is being carried out along with a study of the F-layer trough and resulting trough location vs. K index. Data will be taken during December 74 and January 75 for the high FOES study, along with data for a further high latitude case study including the simultaneous aircraft, satellite and rocket definition of the polar cusp. An extensive study and report on auroral E and sporadic E will be completed by June 75.

Supporting agency address information: AF Cambridge Research Laboratories LI, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0022, TECHNICAL SUMMARY OF AIRCRAFT NEAR FIELD NOISE PREDICTION
R. HAYDEN, Bolt Beranek & Newman Inc., *Cambridge, Massachusetts* 02138 (DF133670; F33615-75-C-3017)

The intense noise associated with military flight vehicles can adversely affect the reliability of the vehicle structure and can degrade the performance of flight and ground personnel. A number of studies have been conducted by the Air Force and industry to provide methods to predict the near field noise associated with aircraft noise sources for use by aircraft designers in alleviating these problems. However, in order to use this information a designer must review a considerable amount of reference material to select the best prediction technique. The objective of this program is to summarize available aircraft near field noise prediction techniques into a concise, readily usable document for application in alleviating structure, equipment and crew performance problems.

Based on an extensive literature survey, all available aircraft near field noise prediction methods will be compiled, summarized and evaluated. Sources which will be considered include all components of noise associated with jet engines and all pseudo-noise associated with flow phenomena.

Supporting agency address information: AF Flight Dynamics Laboratory FYAA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0023, STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA
W.A. DEUTSCHMAN, Smithsonian Institution, *Cambridge, Massachusetts* 02138 (NAS-5-21858)

The object of this program was to determine the feasibility of observing short-lived events with the ERTS satellite and to establish event-detection criteria applicable to different categories of events. Of the 222 events we evaluated, we decided that 53 of them might be detected by the ERTS sensors. Nineteen were subsequently photographed by ERTS and studied by us. We conclude from this program that ERTS photographs are a useful and economical way for individual investigators to obtain data about short-lived events. Larger events can be detected on the photographs without knowledge of their exact location. If the general area is known and which event (e.g., a remote volcano, flood, or vegetation change) is expected to occur, the ERTS photograph can be used to determine if it actually did occur. Small-sized events can be studied if their location is known. Furthermore, from images of the events, we have received useful scientific data that cannot otherwise be easily obtained.

SUPPORTED BY Smithsonian Institution

5.0024, ION VELOCITY DISTRIBUTION IN THE AURORAL IONOSPHERE
P.B. HAYS, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (DES74-21090 A01)

This research addresses the excitation processes operating in the excitation of the second positive band system of molecular nitrogen. The knowledge thus derived will be useful in determining the photoelectron and secondary electron spectra in auroral forms and the daytime ionosphere. Data from the atmospheric explorer satellite will be used in evaluating the results.

SUPPORTED BY U.S. Natl. Science Foundation

5.0025, STUDY OF ATOMOSPHERE ABSORPTION OF HIGH FREQUENCY NOISE
F.D. SHIELDS, Univ. of Mississippi, School of Liberal Arts, *University, Mississippi* 38677 (NAS 3-19431; 743-03-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0026, APPLICATIONS OF AIRBORNE LIDAR MEASUREMENT STUDY
B.G. SCHUSTER, Univ. of Missouri, Graduate School, *Columbia, Missouri* 65202 (NAS 5-20818; 645-10-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0027, ERTS DATA FOLLOW-ON INVESTIGATION
M.P. CARLSON, Univ. of Nebraska, School of Arts, *Lincoln, Nebraska* 68508 (NAS 5-20814; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0028, OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS
P. SQUIRES, Univ. of Nevada, Desert Research Institute, *Reno, Nevada* 89507 (NAS 5-20954; 177-60-41)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0029, ZERO-B CLOUD DROP COALESCENCE EXPERIMENT
J.W. TELFORD, Univ. of Nevada, School of Arts, *Reno, Nevada* 89507 (NAS 8-31441; 175-11-72)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0030, AIR MASS MODIFICATION OVER THE SEA
J.W. TELFORD, Univ. of Nevada, Desert Research Institute, *Reno, Nevada* 89507 (OCD73-00652 A02)

The objective of the proposed research is a clearer understanding of the structure and function of the atmospheric boundary layer over the sea using the NCAR-Buffalo aircraft to gather data. The aircraft will measure the vertical flux of horizontal momentum over the entire area to see how representative are the point measurements of this quantity. In addition, the aircraft will map the sea surface temperature field over the experiment area, enabling the vertical heat flux measurements in the fixed surface network to be related to the mesoscale features of the sea surface temperature field. The aircraft data will also be used to see to what extent spatial variation of the vertical flux of horizontal momentum is related to spatial variation of the sea surface temperature field.

SUPPORTED BY U.S. Natl. Science Foundation

5.0031, LIGHTNING PROTECTION AND THUNDERSTORM ELECTRIFICATION
C.B. MOORE, New Mexico Inst. Min. & Tech., Graduate School, *Socorro, New Mexico* 87801 (AEN72-03398 A03)

This grant supports research into the anomalous behavior of lightning around elevated structures caused by the presence of point discharge ions emitted in intense electric fields. The differences in lightning strikes and in the charges emitted by various structures suggest that improved methods of lightning protection can be devised for high value structures such as nuclear power plants, oil storage facilities, space vehicle launchers and others.

A second phase of the program is directed toward obtaining quantitative data on the rapid growth of rain and hail that has been observed to follow the occurrence of lightning in thunderclouds. The successful triggering of lightning in 1974 needs to be extended to determine if rainfall from thunderclouds can be stimulated over the arid Southwest.

This grant will provide the fourth of four planned years of funding of the thunderstorm program carried out at the summit of the Magdalena Mountains near Socorro, New Mexico with the objectives of determining the origin of thunderstorm electrification and its effects leading to lightning, and precipitation growth.

SUPPORTED BY U.S. Natl. Science Foundation

5.0032, EFFECT OF AMBIENT CONDITIONS ON AIRCRAFT ENGINE EMISSIONS (TASK 2)
H.T. MCADAMS, Calspan Corporation, *Buffalo, New York* 14221 (68-03-2159)

The major objective of this program is to determine the effects of ambient temperature, humidity and pressure on the emissions of hydrocarbons, carbon monoxide, smoke and oxides of nitrogen from aircraft gas turbine engines. Task 1, performed by another contractor, involves the necessary emissions testing and

data collection. Task 2, the subject of this notice, involves the data analysis.

Data obtained in Task 1 will be statistically analyzed to determine the dependence of hydrocarbon, carbon monoxide, smoke and nitrogen oxide emissions on ambient conditions for various engine operating modes and for two or more classes of engines. It is planned to employ a multiple- regression or response-surface approach to develop a functional relation between exhaust emissions and ambient conditions.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0033, EVALUATING SATELLITE IMAGERY FOR INVENTORYING LAND USE AND NATURAL RESOURCES (ERTS-A)
E.E. HARDY, Cornell University, Agricultural Experiment Sta., *Ithaca, New York* 14850 (0063027; NYC-147311)

OBJECTIVE: Evaluate degree of accuracy with which land use and natural resources can be classified and inventoried using imagery obtained from satellites as the major source of input information.

APPROACH: Using simulation techniques, degradable images will be produced with levels of capability that allow separation of only land and water. Improvements in quality, controlled and calibrated, will then be generated, determining at what point on a quality scale different land uses can be determined. Interpretation relies on quality of resolution and scale relationships. These will be the guidelines in generating this information. Satellite imagery provided by NASA will be used for classification and inventorying of land use and resources in various parts of the state. Field checking to determine accuracy attained will be carried out. Some new techniques that rely on hardware will be tested. A Kohler light source will be used for negative enhancement. A 'color slicer' will be used and tested as a means of speeding up general classification techniques. A Zoom Transfer Scope will be used to accommodate the great changes in scale we anticipate.

PROGRESS: To develop a low cost, manual technique for enhancing ERTS-1 imagery and preparing it in suitable format for use by users. Goals of the project include development of enhancement techniques based on concepts in photographic sciences, provide manual means of allowing interpretation of the imagery, low cost products, wide applications compatible with existing information systems. The 70mm film chips received from NASA are standarized. A subtractive color process is employed to produce step enlargements of the 1:3,300,000 images to scales up to 1:66,000. Diazo transparencies produced in magenta, cyan, and yellow for each of the four MSS bands. Data retrieval has been achieved from many diazo color combinations, each combination providing a unique kind of information. Direct map transfer has been accomplished at the scale of 1:250,000 and larger. Enlargement to much larger scales (1:50,000 to as large as 1:5,000) is being developed with quality overhead projectors. Cost of preparation of the photographically enhanced, enlarged negatives and positives and the diazo materials is about 1 cent per square mile.

SUPPORTED BY New York State Government - Albany

5.0034, COMPARISON BETWEEN CALCULATED GRAVITY ANOMALIES FOR DYNAMIC PROCESSES IN THE MANTLE AND OBSERVATIONS
D.L. TURCOTTE, Cornell University, School of Engineering, *Ithaca, New York* 14850 (NSG 5060; 161-02-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0035, METHODS FOR AIRCRAFT TURBINE EMISSIONS CHARACTERIZATION
J.B. MORAN, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Durham, North Carolina* 27711 (26 ACV 19; 72P18227)

Project consists of the development of sampling and analytical procedures for measurement of mass, particle size distribution and composition of particulate emissions from aircraft turbine engines. Initial studies include experiments conducted with engines at a test stand through special arrangements with the Navy Department, and sampling of emissions from jet aircraft during start-up, taxi, and take- off using a specially equipped sampling vehicle. Work begins in FY 73 and is expected to continue through FY 77.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0036, TIME-INTERVAL MULTIBAND REMOTE SENSING FOR ANALYZING URBAN FORESTED AREAS
J.O. LAMMI, Univ. of North Carolina, School of Forestry, *Raleigh, North Carolina* 27607 (0063163; NC04042)

OBJECTIVE: Determine use of 18-day interval ERTS-1 satellite imagery in forest green space analysis, evaluate improvements in green space monitoring through ERTS-B and Skylab, demonstrate utility of multiband camera for ground truth acquisition, and show resource management application of multispectral color-additive viewer.

APPROACH: At least two test sites will be selected, satellite imagery will be studied, ground truth will be determined from multiband camera and field work, results will be transmitted to resource managers.

PROGRESS: Two test sites have been selected, ERTS-1 satellite imagery has been accumulated for several 18-day periods, multispectral camera flights have been carried out over both test sites. A new color additive viewer has been received and is now operational. The multispectral imagery and photography is being studied in the viewer and with other equipment.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0037, WIND WAVE CURRENT INTERACTION STUDIES
UNKNOWN, Univ. of North Carolina, Graduate School, *Raleigh, North Carolina* 27607 (NAS 6-2617; 161-03-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0038, UTILIZATION OF ERTS DATA FOR THE DETECTION AND MONITORING OF SALINE SEEPS IN MONTANA
G.W. PETERSEN, Penn. State University, School of Agriculture, *University Park, Pennsylvania* 16802 (NAS 5-22304; 644-01-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0039, ERTS DATA FOLLOW-ON INVESTIGATION
F. SCHMER, South Dakota State University, School of Agriculture, *Brookings, South Dakota* 57006 (NAS 5-20982; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0040, AIR POLLUTANT DISPERSION BY AIRCRAFT WAKES
J.O. LEDBETTER, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: The formation and persistence of aircraft wakes, especially the vortices that effect dispersion of the pollutants from the planes and from nearby surroundings. All available pictures will be used in defining the vortex actions and lifetimes; however, the principal source of data appears to be radar studies conducted by the U.S. Navy. The use of a special type of radar permitted recording the signals from the vortices. These signals are being analyzed.

SUPPORTED BY Amer. Smelting & Ref. Co. - New York, N.Y.

5.0041, ANALYSIS OF SPECTRAL DATA FOR WHEAT
C. HARLAN, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (NAS 9-14470; 658-10-20)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0042, APPLICATION OF REMOTE SENSING SYSTEM III ON THE IBM 370 COMPUTER
R. SIMMONS, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (NAS 9-14514; 177-52-82)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0043, ERTS DATA FOLLOW-ON INVESTIGATION
M. NACKOWSKI, Univ. of Utah, School of Science, *Salt Lake City, Utah* 84112 (NAS 5-20955; 641-15-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0044, PROTOTYPE EXPERIMENTAL GROIN, POINT MUGU, CALIFORNIA
D.W. BERG, U.S. Army, Coastal Engineering Res. Ctr., *Fort Belvoir, Virginia* 22060 (31237)

Objectives: To determine the manner in which a groin functions to entrap sand, 2) determine the effect of groin dimension and shape on the volume of entrapped sand, and 3) to determine the manner in which sand moves over, around, or through a groin. To accomplish the above objectives entails measurements of littoral factors such as beach and nearshore underwater geometry, wave climatology, beach & nearshore underwater bottom sediment characteristics. Resulting relationships will be published and made available to C of E Divisions/Districts and others for use in the functional design of groins and groin systems.

Approach: To attain the objectives, an investigation includes collection of field data which includes topographic and hydrographic surveys, aerial and ground photography, determination of littoral forces and characteristics of sediments at the PEG site related to spatial and temporal qualities in order to document the functional behavior of the selected groin structure and its effect on the adjoining shorelines. Two groin configurations have been installed and monitored at the PEG site at Point Mugu Naval Air Station, California. When sufficient field data has been collected and analyzed, the results are published to delineate improvements in the functional design of groins.

SUPPORTED BY U.S. Dept. of Defense - Army

5.0045, RADIATIVE TRANSFER MODELS FOR NON-HOMOGENEOUS ATMOSPHERE
S.N. TIWARI, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1153; 176-21-31)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0046, APPLICATION OF REMOTE SENSING TECH'S FOR EVALUATING TRANSPORT'N PLANS USING RECREATIONAL & ENVIRONMENTAL VALUES
B.J. NIEMANN, Univ. of Wisconsin, Agricultural Experiment Sta., *Madison, Wisconsin* (0063167; WIS01929)

OBJECTIVE: Investigate feasibility & desirability of using high altitude & satellite imagery for transportation/recreation planning by developing ways to inventory, compare & evaluate natural & cultural resources for general & land use planning.

APPROACH: Evaluate remote sensing imagery for measuring impact of a proposed highway on recreation resources & identify those specific resources. Determine effectiveness of remote sensing techniques for evaluating alternative routes for optimizing use of recreation resources. Evaluate feasibility of analyzing proposed highway plans with computerized systems using the remote sensing data. Investigate types of satellite information that may be related. Prepare reports; documentation, conclusions & recommendations as to applicability for use by Bureau of Outdoor Recreation and other land use planners.

PROGRESS: Progress includes the interpretation and analysis of RB 57 infrared photography (1:120,000) to determine the applicability of using high platform remote sensors to assist in measuring land resource impact from highway transportation systems. The results indicate that RB 57 type photography is superior to conventional data sources for assessing impact and that the RB 57 derived data can also be utilized for recreational activity computer modeling. Computer modeling software was adapted and developed to test applicability of the RB 57 derived data. The model builder program provides for the weighted manipulation of land resource variables, line finder optimizes a path through a cellular data base and allocation selects areas as a result of competing land activity variables.

SUPPORTED BY Wisconsin State Government - Madison

5.0047, AEROSOL, OZONE AND WATER VAPOR SOUNDINGS FOR SUPPORT OF THE ATMOSPHERIC TRANSMITTANCE MEASUREMENT PROGRAM
J.M. ROSEN, Univ. of Wyoming, School of Arts, *Laramie, Wyoming* 82070 (9-314; 04-5-158-41)

Objective: To obtain data on the physical state of the atmosphere (vertical distributions of aerosol, ozone, water vapor, and temperature) above the Kitt Peak National Observatory. These data are required to analyze and interpret simultaneous measurements of the transmittance and radiative properties of the atmosphere to be conducted at various seasons over a multi-year period.

Approach: Balloons carrying the appropriate measuring instruments will be launched from Kitt Peak around the times transmittance measurements are made. All species will be measured in situ using light scattering techniques for aerosols, an electrochemical sensor utilizing KI oxidation for ozone and an aluminum oxide sensor for water vapor. Measurements will be made from ground level to about 30 Km.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, INVESTIGATIONS OF TRAINING METHODS AND INSTRUCTIONAL TECHNOLOGY FOR AF FLYING TRAINING
J. EUBANKS, Arizona State University, Graduate School, *Tempe, Arizona* 85281 (DF221820; F41609-75-C-0028)

To provide a basic research base for studies in instructional technology and to conduct status studies of the current roles of instructor pilots and student pilots.

Arizona State University will be placed under contract to perform studies as detailed in task orders. This approach will permit the exploitation of the research resources of the entire University rather than being confined to a particular department. Areas to be investigated are pre-instructional strategies, cognitive pre-training, student stress, multi-media/programmed instruction, and instructor pilot roles for specified flying tasks.

Supporting agency address information: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0002, GRAVITATIONAL BIOLOGY
A.H. SMITH, Univ. of California, Agricultural Experiment Sta., *Davis, California* 95616 (0066295; CA-D0-APH-3232-H)

OBJECTIVE: Examine the participation of earth-gravity upon terrestrial processes.

APPROACH: Since no way is known to limit or otherwise influence earth-gravity, all experimentation involves techniques which simulate its change (e.g., centrifugation) or which limit its effect (e.g., buoyant immersion or animal restraint). Biological processes of particular interest at this time are growth (including body composition and differential organ growth) and nutrition (particularly maintenance requirement). Currently only chronic acceleration is utilized as an experimental technique--although future experimentation may involve continuing exercise and animal restraint (hyper/hypokinesia, corresponding in some aspects to changes in the acceleration field--hyper/hypodynamia). Attention also may be given to the weightless aspect of buoyant existence--as encountered with developing embryos.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

6.0003, STUDY OF CHRONOBIOLOGY OF POCKET MICE
R.G. LINDBERG, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NAS 2-8646; 970-24-02)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0004, TASK-PARAMETERS FOR PREDICTING PANEL LAYOUT DESIGN AND OPERATOR PERFORMANCE
R.A. GOLDBECK, Philco Ford Corporation, *Palo Alto, California* 94303 (DF035800; F44620-73-C-0012)

AF function - the Air Force has a continuing requirement for research on design of workspaces in aerospace systems. This work is being conducted by the AMRL Human Engineering Division. Deficiency - operator data is required to predict the task performance times for incorporation in the AMRL/HE Human Engineering Computer Aided Design Program, involving eye-hand movement and multifunction keyboard actions. Objective - the primary objective is to provide verified empirical data usable for experimental investigations in the design of workspaces in aerospace systems. Approach - eye movement, hand movement, and various eye/hand/display combinations will be measured to quantify relationships between indenturing level variables and operator performance on multifunction keyboard tasks. How research contributes - this research is a primary source of measured operator performance of tasks that are inherent in the new generation of multifunction keyboards.

Supporting agency address information: AF Office of Scientific Research NL, 1400 Wilson Blvd., Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0005, DEVELOPMENT OF A COMPUTER-BASED TESTING PROGRAM FOR MEASUREMENT OF COGNITIVE AND PERCEPTUAL SKILLS
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45418; 970-21-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0006, AN INVESTIGATION OF BINDING BETWEEN NUCLEOTIDES AND AMINO ACIDS - AN EXPERIMENT ON THE ORIGIN OF LIFE
J.B. ORENBERG, Calif. State Univ. & Colleges, Graduate School, *San Francisco, California* 94132 (NCA 2-60410; 192-55-61)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0007, RESPIRATORY ANALYSIS
UNKNOWN, Univ. of California, Graduate School, *San Francisco, California* 94122 (NCA 2-70503; 970-21-14)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0008, MECHANISMS OF ASPIRIN AND STRESS INVOLVEMENT IN THE PATHOGENESIS OF GASTRIC ULCERATION
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75511; 970-21-45)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0009, CHEMICAL EVOLUTION AND THE ORIGIN OF LIFE
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75304; 192-55-62)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0010, THE TRANSMISSION OF VIRUS DISEASES IN SPACEFLIGHT
UNKNOWN, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCA 2-85503; 970-21-25)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0011, STUDIES ON THE MORPHOLOGICAL, BIOCHEMICAL, AND GROWTH CHARACTERISTICS OF SALMONELLA NAD SHIGELLA IN WATERWAYS SURROUNDING CAPE KENNEDY
B.E. HARRELL, Florida Agric. & Mech. Univ., School of Science, *Tallahassee, Florida* 32307 (NSG 805; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0012, NAVY ENVIRONMENT - VERIFICATION OF MECHANISM FOR VERTEBRAL FRACTURES IN NAVY AIRCREWS DUE TO ACCELERATIONS PRODUCED DURING EMERGENCY EJECTION
A.I. KING, Wayne State University, School of Engineering, *Detroit, Michigan* 48202 (DN923277; N00014-75-C-0372)

This work is to develop means for preventing vertebral fractures in naval aircrews ejecting from aircraft.

Specially prepared human cadavers in which the vertebral bodies have been instrumented with strain gauges are being subjected to acceleration levels and onset rates comparable to that of the Martin- Baker ejection seat. The data obtained from the experimental measurements is used for formulating a mathematical model to permit prediction of forces sustained by the spinal column under a variety of input conditions.

Supporting agency address information: Office of Naval Research, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

6.0013, ASSESS BIOCHEMICAL CHANGES FOLLOWING LABORATORY ANIMAL EXPOSURE TO FUEL EMISSIONS AND/OR TRACE METALS
M. MALANCHUK, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Cincinnati, Ohio* 45213 (21 AFK 02; 72P17956)

The objective of this investigation is to identify and assess early biochemical changes in animals exposed to individual pollutants, such as trace metals, and emissions from automotive, diesel, aviation and stationary fuel combustion systems. The biochemical studies include the measurement of various enzyme activities and profiles, oxidative metabolism of subcellular organelles and oxidative alteration of tissue components; e.g. polyunsaturated fatty acids. Hamsters are exposed to auto emissions under four different exposure conditions; biochemical parameters such as blood glutathione, leucineaminopeptidase, lactic dehydrogenase, glucose-6-phosphate dehydrogenase, fatty acid composition of lung lavage, and aryl hydrocarbon hydroxylase are examined. Biochemical effects which have been observed include the following: Oxidative destruction of fatty acids, placed on film exposed to fuel emissions. Fatty acid composition of lung lavages and blood glutathione levels changed slightly with exposure. Hamster lung aryl hydrocarbon hydroxylase activity decreased after 5 days and 13 days of exposure to fuel emissions. Intragastric administration of CH3HgCl (0.05 and 0.1 mg/kg, B.M.) caused suppression in 14CO2 output following injection of 14C-1-glucose. This effect was cumulative when treatment was repeated one week later. This alteration is one of the earliest effects observed after exposure to such low concentrations of methylmercury chloride.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

6.0014, COMPARATIVE TOXICOLOGIC EVALUATION OF EMISSIONS FROM FUEL COMBUSTIONS
J.E. STARA, U.S. Environ. Protection Agcy., Natl. Environ. Research Center, *Cincinnati, Ohio* 45213 (21 AFK 01; 72P17955)

Objectives include determination of relative toxic potential of emissions resulting from use of various fuels, fuel additives, and control devices in automotive, diesel and aviation mobile sources and in stationary fuel combustion systems. The test data are used in process of criteria development which are used for setting the environmental pollution standards; and in the process of development of standardized toxicologic test protocols. Serial experiments involving exposure to selected biological models in vivo and in vitro to raw and irradiated whole emissions or components thereof generated by combustion process using chemicophysical characterization of emissions (gaseous and particulate components) and multidisciplinary quantitation of associated biological effects are conducted. In 1972, this approach has been used for the comparative evaluation of emissions and bioeffects resulting from the use of reference fuel with and without a test additive. In FY 73, studies will be conducted on diesel fuel, further gasoline and additives testing, and the incorporation of emission control devices (catalytic converter) using improved facilities and systems. Essential task elements of the project include supportive aerometry (atmosphere monitoring and characterization); engineering (operation, exhaust generation, dilution, delivery, and control systems); and multidisciplinary biological testing approach including biochemical, pathological, and physiological investigations.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

6.0015, RESTRAINT FORCE TRANSDUCERS
J. MILLITELLO, Univ. of Dayton, Graduate School, *Dayton, Ohio* 45409 (DF318580; F33615-75-C-5124)

Mechanical vibration in the aerospace vehicle is an operational stress which affects both the state of health and performance level of crew members. At present, the mechanisms by which these biodynamic stress effects are produced are not adequately understood, one of the specific problem areas being the dynamic interaction between the human body and the restraining (e.g., restraint straps) and/or driving (e.g., crew member's seat) surfaces. The objective of this effort is to develop a force sensor system for measuring the force distribution (normal to body surface) along the driving and restraining surfaces for restrained humans under whole-body vibration. The results of this effort will allow the construction of a force measurement system which will significantly advance the study of biodynamic effects of mechanical vibration.

This exploratory development effort will consider the exploratory development of a complex force sensing system and will provide the basis for a subsequently operational sensing system. The effort will determine the current state of technology, select the most promising state-of-the- art pressure/force transducer, establish design criteria for the desired sensor based on the intended application environment, and accomplish the necessary tradeoffs to achieve a practical sensor system for the intended application. A working prototype sensor system will also be a fundamental output of the effort.

Supporting agency address information: 6570 Aerospace Medical Rsch Lab BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0016, PERCEPTUAL RESEARCH FOR COMPUTER-GENERATED DISPLAYS
M.L. RITCHIE, Wright State University, Graduate School, *Dayton, Ohio* 45431 (DF319270; F33615-75-C-5146)

Technological advances involving the combination of cathode ray tubes and computer information storage and processing capabilities demand that display design practices and principles be reappraised. The purpose of this effort is to initiate systematic research to identify new sets of limiting conditions and develop human engineering design principles consistent with advanced Air Force requirements and computer- generated display capabilities.

A series of experiments will be designed and conducted to establish relationships between principles of visual perception, as applied to the design of computer-generated contact analog displays, and the effectiveness with which the displays transmit visual information to users. The experiments will be supplemented by a detailed study of pertinent literature including that of experimental psychology, graphics arts, art history and motion picture animation. Display design principles will be derived from the experimental and literature research and appropriately demonstrated. Emphasis shall be on application potential in the areas of target acquisition, navigation, instrument landing, etc.

Supporting agency address information: 6570 Aerospace Medical Rsch Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0017, RESEARCH ON A POSSIBLE MECHANISM OF C- G SICKNESS
D.E. PARKER, Miami University, Graduate School, *Oxford, Ohio* 45056 (NAS 9-14538; 970-51-11)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0018, CIRCADIAN TOXICITY OF CERIUM IN RAT LIVER
J.C. NDUAGUBA, Central State University, School of Arts, *Wilberforce, Ohio* 45384 (NSG 2074; 340-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0019, INVESTIGATION INTO THE SEX DIFFERENCES OF THE PITUITARY ADRENAL SYSTEM AND ADAPTATION TO STRESS
UNKNOWN, Oregon Grad. Ctr. Stu. & Res., *Beaverton, Oregon* 97005 (NCA 2-85501; 970-21-16)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0020, EFFECTS OF INSPIRED GASES ON PULMONARY PATHOLOGY AND FUNCTION
R.J. KING, Univ. of Texas, School of Medicine, *San Antonio, Texas* 78229 (DF318650; F41609-75-C-0023)

In many Air Force operational environments personnel are required to breathe oxygen concentrations higher than that of air. Current diluter demand regulators normally supply 30 percent oxygen at ground level and some regulators supply as much as 40 percent oxygen at ground level, increasing to 100 percent oxygen with a safety pressure of 1 1/2 inches of water at 28,000 feet. Aircrews are exposed to 100 percent oxygen at ground level during prebreathing for certain reconnaissance flights. Navy pilots routinely use 100 percent oxygen at all flight altitudes. The use of elevated concentrations of oxygen is probably the most important single factor in the development of atelectasis in pilots of high performance aircraft. Aviators breathing pure oxygen at reduced pressure are particularly susceptible to absorptional atelectasis and often experience it when airway obstruction occurs during exposure to acceleration. Exposure of man to pure oxygen even at normal atmospheric pressure rapidly alters lung function and may cause pulmonary damage. Variant partial pressures of oxygen, carbon dioxide and nitrogen may modify pulmonary cellular elements and surface active material, thereby degrading pulmonary function and increasing susceptibility to conditions such as respiratory infection, pulmonary atelectasis or other causes of impaired pulmonary gas exchange. The purpose of this effort is to attempt to define the mechanisms by which high oxygen concentrations affect the integrity and function of pulmonary tissues. Potential sites of morphologic or physiologic derangements in pulmonary tissues, resulting in degradation and progressive impairment of pulmonary function over the range of breathing mixtures encountered in the life support system design and the development of protective measures to reduce potential pulmonary damage and impaired gas exchange in the lung.

The lung is comprised of over 40 different cell types and it has not yet been possible to differentiate direct effects of oxygen on the metabolism of surface active material from secondary effects resulting from other cellular damage and subsequent transudation into the alveolar space of fluids from the circulation or from damaged cells. Such fluids could interfere with the ability of surface active material to manifest its surface properties even though its own metabolism were unimpaired. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0021, DEVELOPMENT OF A METHOD FOR DETERMINATION OF VITAMIN D METABOLITES IN BLOOD
H.F. DELUCA, Univ. of Wisconsin, School of Agriculture, *Madison, Wisconsin* (NAS 2-8752; 970-21-61)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, RESEARCH OF ACCELERATED LIFE TESTS
N.D. SINGPURWALLA, George Washington University, School of Engineering, *Washington, District of Columbia* 20037 (DF214550; F33615-74-C-4040)

AF function - accelerated testing of long-life components. deficiency - need for better methods of reaching early decisions as to whether long-life requirements are met. Research - solution of problems in theoretical and applied statistics encountered in accelerated testing. How research contributes - better planning of accelerated life tests and analysis and interpretation of results.

Widespread practical use has been made of various methods of accelerated life testing, but the statistical theory for accelerated testing is inadequate. Certain basic methods for analysis of accelerated life test data are lacking. Much of the existing regression theory is based on large sample theory for the normal distribution. There is a need for the development of small sample regression theory for normal and other distributions, including Weibull. Analytic methods are needed for the analysis of data when there are two or more competing failure modes. Optimum tests plans are needed for a variety of models, optimization criteria, types of data censoring, and test constraints. There is a need for models and corresponding data analysis methods for aging-degradation and for progressive and step-stress testing. There is also a need for suitable computer programs for analysis of accelerated data. Effort will be devoted to research directed toward overcoming these deficiencies. The results will be useful in providing support in the area of accelerated life testing which has been requested by AFML/LN and afapl/poe.

Supporting agency address information: Aerospace Research Laboratory LB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0002, RESEARCH IN SECURED MULTI-PROCESSOR COMPUTING SYSTEM
UNKNOWN, Univ. of Hawaii, Graduate School, *Honolulu, Hawaii* 96822 (NAS 2-8600; 366-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0003, COMPUTER PROGRAMS FOR FLIGHT VEHICLE SYNTHESIS
H.H. HILTON, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801

An overall systems concept utilizing an integrated approach incorporating basic aerodynamic, guidance, control, propulsion, and structural principles is being used to develop comprehensive generalized simulation computer programs for flight vehicle synthesis. The purpose is to develop an educational tool to be used in the teaching of flight vehicle synthesis and optimization. Current capabilities include space vehicle flight programs, airplane missions, various structural programs to determine minimum weight and optimum construction, and printed and teletype graphical output on Calcomp.

SUPPORTED BY University of Illinois

7.0004, RESEARCH ON THE PENALTY METHOD AS AN EFFECTIVE TECHNIQUE FOR SOLVING CONSTRAINED MINIMIZATION PROBLEMS
S.S. PINSKY, Coppin State College, Undergraduate School, *Baltimore, Maryland* 21216 (NSG 5052; 051-02-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0005, MULTIVARIATE ANALYSIS AND ITS APPLICATIONS
P.R. KRISHNAIAH, U.S. Air Force, Aerospace Research Labs., *Dayton, Ohio* (DF210290)

AF function - analysis of data consisting of sets of several generally dependent, random variables. Deficiency - lack of efficient statistical techniques for correlation of data dependent upon several variables. Research - develop advanced statistical techniques to improve prediction and clustering discrimination. How research contributes - improves ability to make scientific deductions required in analysis of airframe vibrations, in signal detection, and in pattern recognition.

Work will continue on the comparison of several multivariate populations on the basis of the mean vectors, covariance matrices and eigenvalues of certain random matrices. For the situations where an overall heterogeniety is detected among populations, attempts will be made to develop some techniques to classify them into various clusters. When the number of variables is large, investigations will be made to develop techniques to select the variables which give significant information for the purposes of prediction and discrimination. Some parametric methods of prediction will be developed when the nature of the distribution underlying the data is known. Investigations on the structures of the covariance matrices and means will be made under growth curve models. Work will be continued on RN-AFFDL-04-73-01 entitled 'Power Produce Prediction Models for Vibration Data.' This work will involve the evaluation of the probability integrals associated with the distribution of the linear functions of certain random variables which are not distributed normally. Work will also continue on the RN- AFFDL-04-73-02 entitled 'Probability Density Functions of Vibration Measurements.' The work will involve computation of the probability integrals of the test statistics based on the eigenvalues of complex random matrices. The work on this RN will also involve the analysis of actual data on vibration measurements to be provided by the Air Force Flight Dynamics Laboratory. Work will also be continued on TN-AFFDL-ARL- 1201-74-02 entitled 'Statistical Theory for Multi-Sensor Air Data Measurements of Advanced Flight Control Measurements.' This work involved deriving some multivariate distributions and analysis of actual data to be provided by AFFDL.

Supporting agency address information: Aerospace Research Laboratory LB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0006, HYDRAULIC DYNAMIC ANALYSIS
R.E. QUIGLEY, U.S. Air Force, Aero Propulsion Lab., *Dayton, Ohio* 45433 (DF455370)

The purpose of this program will be to model the dynamic effects of an aircraft hydraulic system. Computer models will be developed and verified in the laboratory.

The approach will be to set up, beginning with a simple system, a hydraulic circuit in the laboratory and develop an analytic model which can be verified.

Supporting agency address information: AF Aero-Propulsion Laboratory POP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

7.0007, DEVELOPMENT OF A MODERATELY SIZED FINITE-ELEMENT PROGRAM FOR NONLINEAR STRUCTURAL ANALYSIS
J.A. STRICKLAND, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (NAS 8-31332; 909-55-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0008, MATHEMATICAL FOUNDATIONS OF SHELL THEORY AND BIOMEDICAL APPLICATIONS
J.G. SIMMONDS, Univ. of Virginia, School of Engineering, *Charlottesville, Virginia* 22903 (MPS73-08650 A02)

This is a continuation of research previously supported GP-38197 A01.

J. Simmonds and G. Latta will continue the work on shell theory. In particular, they will develop mathematical techniques for calculating stress-intensity factors for arbitrarily oriented cracks in thin shells of arbitrary shape; including negative curvature. Results will have application to design of pressure vessels, aircraft and space vehicles.

SUPPORTED BY U.S. Natl. Science Foundation

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, ATOMIC AND MOLECULAR STATE DISTRIBUTIONS FROM AERONOMICALLY IMPORTANT INTERACTIONS
T.G. SLANGER, Stanford Research Institute, *Menlo Park, California* 94025 (DES75-09364)

This grant will permit the study of vibrational distributions arising from interactions between excited atoms and ground state molecules. These rates are extremely important to many aeronomic processes and will aid the modeling of the atmosphere.

SUPPORTED BY U.S. Natl. Science Foundation

8.0002, JOINT USE OF SPECIALIZED RESOURCES TO SUPPORT BASIC, EXPLORATORY AND APPLIED RESEARCH IN ACOUSTICS
K. KARAMCHETI, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NCA 2-45512; 505-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0003, FEASIBILITY OF MULTIPLE DETECTOR FOCAL PLANE ARRAY UV SPECTROMETER FOR THE AMPS LABORATORY
P.D. FELDMAN, Johns Hopkins University, School of Arts, *Baltimore, Maryland* 21218 (NAS 8-31413; 356-36-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0004, VERY LONG BASE INTERFEROMETRY
C.C. COUNSELMAN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (NSG 7118; 195-20-01)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0005, LES 8/9 DNS NUCLEAR SAFETY TECHNICAL SUPPORT
E.W. HOLTZSCHEITER, U.S. Air Force, Weapons Laboratory, *Albuquerque, New Mexico* 87117 (DF183200)

Nuclear safety evaluations of the Lincoln Experimental Satellite 8/9 (LES 8/9) is provided to Directorate of Nuclear Safety (DNS) in accordance with AFR 122-1, 122-5, and 122-16.

This support is provided by attending safety analysis and review meetings of the LES 8/9 RTG system. Action items assigned to these meetings are studied and technical evaluations submitted to DNS and to the Interagency Nuclear Safety Review Panel (INSRP). Cognizance and evaluation of all nuclear safety tests (RTG) will be required.

Supporting agency address information: AF Weapons Laboratory SEC, Kirtland AFB, N. Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

8.0006, PHYSICS AND CHEMISTRY OF SMALL AIRBORNE PARTICLES
B.E. DAHNEKE, Univ. of Rochester, School of Medicine, *Rochester, New York* 14627 (AT(11-1)-3490)

The object of this research is to develop and apply new techniques for detecting and measuring airborne particulates, especially toxic and potentially toxic particulates. Present methods are not fully adequate for this task for several reasons. One new approach that is especially promising is time flight aerosol beam spectrometry (TOFABS). In this system, airborne particulates are confined to a well defined beam in a vacuum chamber. Sensitive detection techniques are then used to measure the individual particles. One technique measures the time of flight of each particle over a fixed path length and thereby provides a measure of the aerodynamic size of the particle since the acceleration of the particle in the entrance nozzle of the vacuum chamber, and thus the terminal velocity of the particle, depends on aerodynamic size. Chemical analysis of individual (already sized) particles also seems feasible. We anticipate using mass spectrometry for this purpose. Thus we hope to obtain TOFABS measurements of airborne particulates that are both highly accurate and comprehensive. Such data will, hopefully, reveal new knowledge about the sources, extent, and toxicity of atmospheric aerosols.

Results: All elements of the size measuring part of a second-generation TOFABS have been designed and are presently under construction. Components for measuring the chemical composition are presently being designed.

SUPPORTED BY U.S. Energy Res. & Dev. Admin. - B.E.R.D.

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, TO ENCOURAGE MEMBERS OF MINORITY GROUPS TO UNDERTAKE PROFESSIONAL CAREERS IN SCIENTIFIC AND ENGINEERING FIELDS
W. WILLIAMS, Lincoln University, Graduate School, *Lincoln University, Pennsylvania* 19352 (NGT 39-108-750; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

9.0002, POLICY CAPTURING FOR PROJECT SELECTION DECISION
G.R. WAGNER, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: An application of policy capturing to the problem of R & D project selection: Policy capturing was used to investigate the project selection decision of a large aerospace corporation. The resulting decision model enhanced the ability to select projects in a straightforward and unbiased manner. Implementation of the system is now in effect.

SUPPORTED BY University of Texas

9.0003, HYDROGEN PRODUCTION ECONOMETRIC STUDIES
J.R. HOWELL, Univ. of Houston, School of Engineering, *Houston, Texas* 77004 (NAS 9-14516; 778-60-9X)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, INFRARED OBSERVATIONS OF THE PLANETS
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NSG 7114; 196-41-80)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0002, JUPITER COLLOQUIUM
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NSG 7123; 384-47-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0003, INVESTIGATION OF THE FAR UV SPECTRA OF THE POLE ON BE STARS CEN AND CYG
C.J. PETERS, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NSG 5056; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, DYNAMICAL STUDIES OF SOLAR SYSTEM ORIGIN AND EVOLUTION
UNKNOWN, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NSG 7113; 185-50-81)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, CARBONACEOUS CHONDRITES EARLY IRRADIATION AND 244/PO FISSION RECORDS
UNKNOWN, Univ. of California, Graduate School, *San Diego, California* 92038 (NSG 7121; 195-20-04)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0006, REMANENT MAGNETIZATION OF TEKTITES
M.D. FULLER, Univ. of California, Graduate School, *Santa Barbara, California* 93106 (NSG 7122; 195-20-04)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0007, VENUS
P.T. MCCORMICK, Univ. of Santa Clara, School of Science, *Santa Clara, California* 95053 (NCA 2-85507; 185-47-67)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0008, PHOSPHORUS IN COARSE STRUCTURED IRON METEORITES
R.S. CLARKE, Smithsonian Institution, *Washington, District of Columbia* 20560 (3370-49)

The relationship of phosphide precipitation to the development of the Widmanstatten pattern in coarse structured iron meteorites is under study. The distribution of nickel and phosphorus within schreibersite and kamacite and taenite is being used as a tool in study of the cooling history of these meteorites.

SUPPORTED BY Smithsonian Institution

10.0009, CHEMICAL INVESTIGATION OF METEORITES
E. JAROSEWICH, Smithsonian Institution, *Washington, District of Columbia* 20560 (6500-30)

Currently, the chemical investigation of stony meteorites is in progress. This work encompasses the chemical analysis of acid soluble and acid insoluble phases of meteorites for major and minor constituents. Also, the analysis of meteoritic separates is performed. The analysis of meteorites is a part of a broader study of mineralogy, petrology and classification of meteorites.

SUPPORTED BY Smithsonian Institution

10.0010, ANALYSIS OF LUNAR ROCKS
B. MASON, Smithsonian Institution, *Washington, District of Columbia* 20560

The major work under this project is the characterization of lunar minerals and rocks in terms of their physical properties, chemical compositions, and distribution of minor and trace elements, with parallel studies of comparable meteoritic and terrestrial materials and synthetic melts. The aim is to decipher the geological history of the landing sites from the mineralogical, petrographic, and chemical composition of the materials returned, correlating this information with the ground-based observations of the astronauts and the results of geophysical experiments. Our ultimate objective is the elucidation of the major problems of the origin and history of the moon, and its relationship to other bodies in solar system, particularly the earth and the asteroids and meteorites.

SUPPORTED BY Smithsonian Institution

10.0011, THEORETICAL MODELS OF JUPITER, SATURN, AND THE ATMOSPHERES OF CARBON STARS
UNKNOWN, Iowa State University, Graduate School, *Ames, Iowa* 50010 (NCA 2-40504; 185-50-61)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0012, LINE BLOCKING MEASUREMENTS IN THE ULTRA-VIOLET SPECTRA OF SIRIUS, PROCYON AND CANOPUS
R.A. BELL, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (NSG 5059; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0013, INVESTIGATION OF THE SHARP-LINED TAU HERCOLIS STAR
S.J. ADELMAN, Boston University, Graduate School, *Boston, Massachusetts* 02215 (NSG 5055; 831-42-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0014, FLIGHT EXPERIMENTS - GAMMA-RAY BALLOON EXPERIMENT
G.G. FAZIO, Smithsonian Institution, *Cambridge, Massachusetts* 02138

To study the emission of gamma radiation from celestial sources, a new type of detector, the gas-Cerenkov telescope, has been developed. Two versions of this detector, one in the 10-100 MeV region, the other in the region above 150 MeV (in conjunction with Cornell University), have been constructed and flown in high-altitude balloons to search for gamma rays from cosmic sources.

SUPPORTED BY Smithsonian Institution

10.0015, MEASUREMENT OF TRITIUM AND ARGON IN RETURNED LUNAR MATERIALS - ISOTOPIC STUDIES
E.L. FIREMAN, Smithsonian Institution, *Cambridge, Massachusetts* 02138 (NGR 09-015-145)

1. Measure Ar37, Ar39, and H3 as a function of depth in the deep core of a large documented rock from Apollo 17.

2. Continue to measure the Ar39 and H3 in two large documented rocks of different chemical compositions from either Apollo 17 or previous Apollo missions.

3. Also measure Ar39 production cross sections in thick Ti, Ca, and K targets bombarded with protons of energies between 50 and 600 Mev.

4. Measure H3 in four quadrants of oriented aluminum tube G3 from Surveyor 3. Determine ages and histories of meteorites by means of isotope measurements.

SUPPORTED BY Smithsonian Institution

10.0016, STELLAR PHYSICS - SOLAR OBSERVATIONS
R.W. NOYES, Smithsonian Institution, *Cambridge, Massachusetts* 02138

This project is an ongoing one, which includes both satellite and ground-based observations. Satellite observations were obtained in 1967 and 1969 from the Orbiting Solar Observatories OSO 4 and OSO 6, by means of extreme ultraviolet spectrometers built by the Harvard College Observatory Solar Satellite Project. The data have opened up a new spectral region to detailed physical analysis and will continue for several years to provide fundamental information on the physics of the solar corona.

In a related program of ground-based observations, the structure of the solar atmosphere near its temperature minimum is being explored, by use of high-resolution infrared (5 micron) spectra of the sun obtained at Kitt Peak National Observatory. These data are being analyzed using a SAO stellar atmospheres program and should provide definitive information on the solar temperature minimum. At the same time, the structure of sunspots is being studied with the same observing equipment.

SUPPORTED BY Smithsonian Institution

10.0017, GAMMA RAY STUDIES
T. WEEKES, Smithsonian Institution, *Cambridge, Massachusetts* 02138

A large optical reflector is being used at Mount Hopkins, Arizona, to search for Cerenkov light produced by celestial gamma rays interacting in the atmosphere. The detector is sensitive to photons with energy greater than 10 to the 11th power electron volts. Objects such as the Crab Nebula, quasi-stellar radio sources, radio galaxies, pulsars, and X-ray stars are being investigated as gamma-ray sources.

The necessary phototubes were purchased and modifications were made to the holder on the telescope to accomodate larger tubes.

SUPPORTED BY Smithsonian Institution

10.0018, THE EFFECT OF PHOSPHORUS ON THE DEVELOPMENT OF THE STRUCTURE OF IRON METEORITES
J.I. GOLDSTEIN, Lehigh University, School of Engineering, *Bethlehem, Pennsylvania* 18015 (DES74-22518)

This is a continuation of research supported under NSF grant GA- 15349 and Amendments 01 through 03.

This project involves metallurgical studies of iron meteorites. A combination of chemical analyses and theoretical diffusion models will be used to study: (1) temperatures of formation and cooling rates of iron meteorites; (2) influence of minor components (carbon, phosphorus, cobalt) on the chemical behavior of meteorites during formation and cooling. The results will provide important basic information about the origin of meteorites and planets during formation of the solar system.

SUPPORTED BY U.S. Natl. Science Foundation

10.0019, THE EARTH MOON SYSTEM - DYNAMICS AND PARAMETER ESTIMATION
W.J. BREEDLOVE, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1152; 383-24-03)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GENERAL

11.0001, DEVELOPMENT OF TESTING AND TRAINING PROGRAMS TO PRODUCE GROUPS OF PROFESSIONALS FOR HIGH-STRESS MISSIONS
J.E. SIEBER, Calif. State Univ. & Colleges, Graduate School, *Hayward, California* 94541 (NCA 2-90401; 970-21-51)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0002, THE NATIONAL AIRCRAFT COLLECTION
L.S. CASEY, Smithsonian Institution, *Washington, District of Columbia* 20560

Documenting the aircraft collection of the U.S. National Aircraft Collection. Documenting includes graphic as well as the technical and historical aspects of the specimens in this, the largest collection of its kind, in the world.

A catalog documenting some 20 to 25% of the Collection is being prepared.

SUPPORTED BY Smithsonian Institution

11.0003, PUBLICATION - AIRCRAFT IN MUSEUMS AROUND THE WORLD
L.S. CASEY, Smithsonian Institution, *Washington, District of Columbia* 20560

This listing of aircraft in museums is directed toward making greater use of actual specimens for technical and historical research purposes. It is for this exchange of information and specimens that this list contains primarily aircraft in museums, though we are aware that many other historical and unique aircraft survive throughout the world.

Periodically, this automatic data process list is updated for information submitted by museums and published for their use.

SUPPORTED BY Smithsonian Institution

11.0004, HISTORY OF ROCKETS AND SPACE FLIGHT
F.C. DURANT, Smithsonian Institution, *Washington, District of Columbia* 20560

Refinement of chronological history of rockets and space flight; identification of individuals, inventions and events that influence technological advances. Major effort includes nineteenth century rocket ordinance, lifesaving and whaling rockets, biographical data, military engagements using rockets, history of pyrotechnics as related to military rockets. Study of development of literature of spaceflight as related to technology of times. Europe, eastern Europe, U.S.S.R. and India are foreign areas involved.

SUPPORTED BY Smithsonian Institution

11.0005, AERO ENGINES IN MUSEUMS AROUND THE WORLD
R.B. MEYER, Smithsonian Institution, *Washington, District of Columbia* 20560

This is a list of 1,200 air breathing engines (mostly piston gasoline and turbojets) in museums around the world.

It has been printed from punched cards and distributed to 100 supporting museums with which information was exchanged.

A second edition (more complete and correct) is proposed. It may eventually be combined with a similar list applying to aircraft, and published with illustrations by the Smithsonian Institution Press.

The additional information needed to produce a second edition is being collected. This second edition will not be completed until after the new NASM building has opened in July 1976 due to higher priority work.

SUPPORTED BY Smithsonian Institution

11.0006, TRAINING OF PREDOCTORAL GRADUATE STUDENTS IN SPACE-RELATED SCIENCES AND ENGINEERING
M.Q. BURRELL, Southern Univ. A. & M. College, School of Engineering, *Baton Rouge, Louisiana* 70813 (NGT 19-005-750; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0007, LAUNCH AND RECOVERY SYSTEMS
J.F. DWYER, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243740)

AF function - advanced balloon systems (surveillance, delivery operations, environmental research support, space equipment test). Deficiency - launching methods for single cell balloons to carry payloads of 10,000 pounds or more do not exist and recovery systems for this payload weight class are complicated and inefficient. Objective - develop a non-dynamic single cell balloon launch method and a compatible recovery parachute system for payloads of 10,000 pounds or more. How research contributes - this development will obviate the need to develop advanced balloon platform launchers, eliminate launch forces on single cell balloons, thereby increasing their capabilities, and provide lower cost and more efficient payload recovery systems.

Balloons will be modified to include a cloth reefing sleeve designed to prevent formation of a sail by constraining the undeployed balloon material until required to accommodate additional inflatant. These balloons will be flight tested, one with a 5000 pound payload and one with a 10,000 pound payload, each using re-entrant top parachutes, proposed as more efficient and less costly recovery systems.

Supporting agency address information: AF Cambridge Research Laboratories LC, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

11.0008, HIGH ALTITUDE SYSTEM DEVELOPMENT
J.B. WRIGHT, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (DF243950)

AF function - advanced high altitude tethered balloon system for surveillance, monitoring, environmental research, space vehicle test. Deficiency - current tethered-balloon technology and equipment limits the use of this type of vehicle to altitudes of less than 10 km. Objective - develop a tethered balloon system capable of flying at an altitude of 20 km. How research contributes - development and flight of a balloon at 20 km will prove the feasibility of operating tethered balloons under these conditions on an operational basis.

The design of a 20 km system, including balloon, cable, winch, and other equipment will be undertaken. Computer simulations of various combinations will be undertaken in order to examine all parameters associated with the problems of attaining higher altitudes. A study of Mereorological profiles in the area of the test site is required-winds for example have a significant effect on the sizing of equipment. High surface temperatures will exist in the most opportune months, windwise, necessitating provisions for extra cooling of the winch during long periods of reeling. A low altitude flight test will be made to check the adequacy of winch cooling and to evaluate a prototype of the best candidate kevlar cable. Suitable balloon and cable specifications will be established to enable their purchase in the following year.

Supporting agency address information: AF Cambridge Research Laboratories LC, L.G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

11.0009, TRAINING OF PREDOCTORAL GRADUATE STUDENTS IN SPACE-RELATED SCIENCES AND ENGINEERING
L.A. THEYE, Univ. of New Mexico, Graduate School, *Albuquerque, New Mexico* 87106 (NGT 32-004-750; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0010, TRAINING OF PREDOCTORAL GRADUATE STUDENTS IN SPACE-RELATED SCIENCES AND ENGINEERING
Y.Y. CLARK, Tennessee State University, Graduate School, *Nashville, Tennessee* 37203 (NGT 43-014-750; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0011, TRAINING OF PREDOCTORAL GRADUATE STUDENTS IN SPACE-RELATED SCIENCES AND ENGINEERING
R.W. GUARD, Univ. of Texas, School of Engineering, *El Paso, Texas* 79999 (NGT 44-085-750; 010-00-00)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N75-23470*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF GEOMETRIC VARIABLES ON THE PERFORMANCE OF A PROBE FOR DIRECT MEASUREMENT OF FREE-STEAM STAGNATION PRESSURE IN SUPERSONIC FLOW
Lana M. Couch Washington May 1975 70 p refs
(NASA-TN-D-7887; L-9757) Avail: NTIS HC $4.25 CSCL 14B

An investigation was conducted at Mach numbers of 1.41, 1.83, and 2.20 to determine the effects of parametric variations in the height of the pitot-tube center line from the probe surface and in the radius of the surface curvature on the pressure recovery of a probe designed to measure the free-stream stagnation pressure. The probe consists of a pitot tube mounted on the surface of a curved cylinder of circular cross section. The pitot tube senses the pressure of the stream tube which has been slowed by isentropic compression along the curved surface. Pressure recovery, greater than or equal to 99.8 percent of the free-stream stagnation pressure, was obtained for a wide range both of angle of attack and of yaw for probes satisfying the predetermined optimum design criteria. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-23471 Illinois Univ., Urbana.
FLOW OF A PARTICULATE SUSPENSION IN THE WAKE OF A CIRCULAR CYLINDER Ph.D. Thesis
Donald Lee Fenton 1974 134 p
Avail: Univ. Microfilms Order No. 75-11764

The continuum approach to particulate flow in the wake region behind a circular cylinder was utilized. Separation of the gaseous phase equation of mean motion from the particulate phase equation of mean motion is accomplished through conditions accompanied with the assumption of a dilute suspension of particulate material. The governing equations are applicable to laminar and turbulent flow. Theoretical calculations and experimental measurements were performed to establish the characteristics of both the gaseous and particulate wakes. The gaseous wake flow experimental results conformed to published results thus permitting meaningful comparison to the particulate wake. Measurements within the particulate wake included particulate velocity and particulate density (concentration) where wake centerline defects and transverse distributions were determined. Dissert. Abstr.

N75-23472 Houston Univ., Tex.
ANALYSIS OF FLUID FLOW IN THE ENTRANCE REGION OF A DUCT WITH AN ECCENTRIC ANNULAR CROSS-SECTION Ph.D. Thesis
John Terry Wilson 1974 110 p
Avail: Univ. Microfilms Order No. 75-11001

The velocity development is analyzed of laminar incompressible flow in the entrance region of a straight duct with an unchanging eccentric annular cross-section. A linearized version of the governing equations is solved under the assumptions that the velocity is zero on the duct wall and that the initial velocity profile is uniform across the cross-section. The analysis leads to a two-dimensional eigenvalue value problem which is then posed in the appropriate Hilbert space. Galerkin's method is shown to converge for, and then applied to, this eigenvalue problem. Dissert. Abstr.

N75-23473 North Carolina State Univ., Raleigh.
UNSTEADY STALL OF A SLENDER ELLIPTIC CYLINDER IN A FREESTREAM OF SINUSOIDALLY VARYING ANGLE OF INCIDENCE Ph.D. Thesis
Keith Lee Kushman 1974 82 p
Avail: Univ. Microfilms Order No. 75-10410

A solution of the equations governing the unsteady laminar two-dimensional boundary layer flow on a slender elliptic cylinder in a freestream of periodically varying angle of attack is presented. The governing equations are transformed into a coordinate system in which the separation point is independent of the transformed time. The angle of attack oscillation amplitude is assumed to consist of a steady-state component and small perturbations proportional to the amplitude of the angle of attack oscillation. The dynamic lift characteristics of the ellipse are determined by the application of a condition relating the nonsteady circulation to the vorticity flux across the line dividing the boundary layer and wake fluids. Dissert. Abstr.

N75-23474 Stevens Inst. of Tech., Hoboken, N.J.
NONSTATIONARY AERODYNAMICS OF ARBITRARY CASCADES IN COMPRESSIBLE FLOW Ph.D. Thesis
Ron-Ho Robert Ni 1974 159 p
Avail: Univ. Microfilms Order No. 75-2812

The time marching technique is applied to the numerical computation of the nonstationary aerodynamics of harmonically oscillating cascades with thick and cambered blades in either subsonic or supersonic flows. The governing equations are transformed into a system of unsteady perturbation equations based upon the known steady state flow solution of the same cascade geometry at stationary position and solved numerically by adopting a second order finite difference scheme. The complex unsteady amplitude of the perturbations are used as the dependent variables so that the computation can be performed in a two-dimensional channel guided by two adjacent blades for any inter-blade phase angle. A method of handling the boundary conditions is developed which matches the order of accuracy for the boundary points with the order for the interior points. The wake region behind the trailing edge of each blade in the cascade is treated as a slip plane. Results are presented. Author

N75-23475 Tecimar S.A.R.L., Paris (France).
STUDIES AND RESEARCH ON MARINE HULLS WORKING WITH NATURAL GROUND EFFECT Final Report
L. P. Unterstellen and M. Ebersolt Apr. 1974 79 p refs In FRENCH; ENGLISH summary
(Contract DGRST-69-01-723)
Avail: Issuing Activity

Methods for computing thick and thin airfoils of infinite aspect ratio are presented. The solutions are used to determine the characteristics of a finite aspect ratio airfoil. Such an airfoil was tested for several flight conditions in an aerodynamical wind tunnel. Test results were applied to the design a hovercraft for marine use. ESRO

N75-23476*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SURFACE FINISHING Patent Application
Jack A. Kinzler, James T. Heffernan, Leroy G. Fehrenkamp, and William S. Lee, inventors (to NASA) Filed 16 Apr. 1975 26 p
(NASA-Case-MSC-12631-1; US-Patent-Appl-SN-568541) Avail: NTIS HC $3.75 CSCL 01C

An airfoil configuration and manufacturing process was designed to reduce or eliminate air turbulence created by surface irregularities in metal due to rivets, wrinkles, and butt-joints. The metal surface of an airfoil was cleaned, then coated with a thin layer of a fluid adhesive over which a sheet of thin plastic film was stretched. Tension was applied to the film and the resultant surface was squeezed to cause the adhesive to conform to the irregularities, remove any bubbles, and smooth out any wrinkles in the film. The adhesive was then allowed to set. The resulting surface is smooth and relatively free of the normal irregularities present in the standard metal airfoil, particularly for low speed aircraft. NASA

N75-23477*# Boston Univ., Mass. Dept. of Aerospace Engineering.
A FINITE-ELEMENT METHOD FOR LIFTING SURFACES IN STEADY INCOMPRESSIBLE SUBSONIC FLOW
Luigi Morino and Emil Suciu Dec. 1974 38 p refs
(Grant NGR-22-004-030)
(NASA-CR-142811; TR-74-05) Avail: NTIS HC $3.75 CSCL 01C

The problem of potential steady subsonic flow for lifting surfaces is considered. This problem requires the solution of an integral equation relating the value of the potential discontinuity on the lifting surface and its wake to the values of the normal derivative of the potential which are known from the boundary conditions. The lifting surface is divided into small (quadrilateral hyperboloidal) surface elements, which are described in terms of the Cartesian components of the four corner points. The values of the potential discontinuity and the normal derivative of the potential are assumed to be constant within each element and equal to their values at the centroids of the elements. This yields a set of linear algebraic equations. Numerical results are in good agreement with existing ones. Author

N75-23478*# Boston Univ., Mass. Dept. of Aerospace Engineering.
SUBSONIC AND SUPERSONIC INDICIAL AERODYNAMICS AND AERODYNAMIC TRANSFER FUNCTION FOR COMPLEX CONFIGURATIONS
Luigi Morino Sep. 1974 33 p refs
(Grant NGR-22-004-030)
(NASA-CR-142818; TN-74-01) Avail: NTIS HC $3.75 CSCL 20D

A general theory for indicial-potential-compressible aerodynamics around complex configurations is presented. The motion is assumed to consist of constant subsonic or supersonic speed (steady state) and small perturbations around the steady state. Using the finite-element method to discretize the space problem, a set of differential-difference equations in time relating the potential to its normal derivative on the surface of the body was obtained. The aerodynamics transfer function was derived by using standard method of operational calculus. Author

N75-23479*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENTAL STUDY OF THE EFFECT ON SPAN LOADING ON AIRCRAFT WAKES
Victor R. Corsiglia, Vernon J. Rossow, and Donald L. Ciffone May 1975 11 p refs Presented at the AIAA 8th Fluid and Plasma Dyn. Conf., Hartford, 16-18 Jun. 1975
(NASA-TM-X-62431; A-6064) Avail: NTIS HC $3.25 CSCL 20D

Measurements were made in the NASA-Ames 40- by 80-foot wind tunnel of the rolling moment induced on a following model in the wake 13.6 spans behind a subsonic transport model for a variety of trailing edge flap settings of the generator. It was found that the rolling moment on the following model was reduced substantially, compared to the conventional landing configuration, by reshaping the span loading on the generating model to approximate a span loading, found in earlier studies, which resulted in reduced wake velocities. This was accomplished by retracting the outboard trailing edge flaps. It was concluded, based on flow visualization conducted in the wind tunnel as well as in a water tow facility, that this flap arrangement redistributes the vorticity shed by the wing along the span to form three vortex pairs that interact to disperse the wake. Author

N75-23480*# Kanner (Leo) Associates, Redwood City, Calif.
GROUND EFFECTS FOR JET LIFT VTOL
R. Behnert, R. Roekmojoto, and K-H. Kleppe Washington NASA May 1975 254 p refs Transl. into ENGLISH from ZTL-Zukunfts-Technik-Luft FAG 4, Jahresabschlussbericht 1971, VFW-Fokker (West Germany), 8 Apr. 1971
(Contract NASw-2481)
(NASA-TT-F-16359) Avail: NTIS HC $8.50 CSCL 01A

The conversion hypothesis proposed by VFW-Fokker is shown to be valid for the fountain of a four jet group. The effects of temperature upon the expansion and the behavior of the mixture regions of compressible gas flows is isolated. The position of the ground stagnation point for multi-jet groups is determined with the assumption of two dimensional behavior of the flow at the ground region. Momentum variations achieved through increases in nozzle size of momentum density yield varying ground stagnation points. The total pressure at the region of origin of a fountain is shown to be independent from the distance from the ground of the generating nozzles. The fountain direction is approximated from the momentum ratio at the ground stagnation point. Author

N75-23481*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VELOCITY AND ROLLING-MOMENT MEASUREMENTS IN THE WAKE OF A SWEPT-WING MODEL IN THE 40 BY 80 FOOT WIND TUNNEL
Vernon J. Rossow, Victor R. Corsiglia, Richard G. Schwind (Nielson Eng. and Res., Inc., Mountain View, Calif.), Juanita K. D. Frick (Army Air Mobility R and D Lab., Moffett Field, Calif.), and Opal J. Lemmer (Army Air Mobility R and D Lab., Moffett Field, Calif.) Apr. 1975 36 p refs
(NASA-TM-X-62414; A-5918) Avail: NTIS HC $3.75 CSCL 01A

Measurements were made in the wake of a swept wing model to study the structure of lift generated vortex wakes shed by conventional span loadings and by several span loadings designed to reduce wake velocities. Variations in the span loading on the swept wing generator were obtained by deflecting seven flap segments on each side by amounts determined by vortex lattice theory to approximate the desired span loadings. The resulting wakes were probed with a three component, hot wire probe to measure velocity, and with a wing to measure the rolling moment that would be induced on a following aircraft. The experimental techniques are described herein, and the measured velocity and rolling moments are presented, along with some comparisons with the applicable theories. Author

N75-23482*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
ANALYSIS OF WAKE VORTEX FLIGHT TEST DATA BEHIND A T-33 AIRCRAFT
Gary D. Kuhn and Robert A. Jacobsen Apr. 1975 80 p refs
(Contract NAS2-6973)
(NASA-CR-137669; NEAR-TR-84) Avail: NTIS HC $4.75 CSCL 20D

Measurements of the vortex system behind a T-33 aircraft were obtained by a Learjet equipped with a boom carrying a three-wire, hot-wire anemometry probe and other instrumentation. Analysis of the measurements using a computerized geometric method indicated the vortices had a core radius of approximately 0.11 meter with a maximum velocity of 25 meters per second. The hot-wire anemometer was found to be a practical and sensitive instrument for determining in-flight vortex velocities. No longitudinal instabilities, buoyant effects or vortex breakdowns were evident in the data which included vortex wake cross sections from 0.24 to 5.22 kilometers behind the T-33. Author

N75-23483*# Nielsen Engineering and Research, Inc., Mountain View, Calif.

CALCULATION OF STATIC LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF STOL AIRCRAFT WITH UPPER SURFACE BLOWN FLAPS

M. R. Mendenhall, S. C. Perkin, Jr., F. K. Goodwin, and S. B. Spangler Apr. 1975 63 p refs

(Contract NAS2-8268)

(NASA-CR-137646; NEAR-TR-83) Avail: NTIS HC $4.25 CSCL 20D

An existing prediction method developed for EBF aircraft configurations was applied to USB configurations to determine its potential utility in predicting USB aerodynamic characteristics. An existing wing-flap vortex-lattice computer program was modified to handle multiple spanwise flap segments at different flap angles. A potential flow turbofan wake model developed for circular cross-section jets was used to model a rectangular cross-section jet wake by placing a number of circular jets side by side. The calculation procedure was evaluated by comparison of measured and predicted aerodynamic characteristics on a variety of USB configurations. The method is limited to the case where the flow and geometry of the configuration are symmetric about a vertical plane containing the wing root chord. Comparison of predicted and measured lift and pitching moment coefficients were made on swept wings with one and two engines per wing panel, various flap deflection angles, and a range of thrust coefficients. The results indicate satisfactory prediction of lift for flap deflections up to 55 and thrust coefficients less than 2. The applicability of the prediction procedure to USB configurations is evaluated, and specific recommendations for improvements are discussed. Author

N75-23484*# Wichita State Univ., Kans.

EFFECTIVENESS OF SPOILERS ON THE GA(W)-1 AIRFOIL WITH A HIGH PERFORMANCE FOWLER FLAP

W. H. Wentz, Jr. Washington NASA May 1975 70 p refs

(Grant NGR-17-002-072)

(NASA-CR-2538) Avail: NTIS HC $4.25 CSCL 01A

Two-dimensional wind-tunnel tests were conducted to determine effectiveness of spoilers applied to the GA(W)-1 airfoil. Tests of several spoiler configurations show adequate control effectiveness with flap nested. It is found that providing a vent path allowing lower surface air to escape to the upper surface as the spoiler opens alleviates control reversal and hysteresis tendencies. Spoiler cross-sectional shape variations generally have a modest influence on control characteristics. A series of comparative tests of vortex generators applied to the (GA-W)-1 airfoil show that triangular planform vortex generators are superior to square planform vortex generators of the same span. Author

N75-23485# Advisory Group for Aerospace Research and Development, Paris (France).

AIRFRAME/PROPULSION INTERFERENCE

Mar. 1975 419 p refs In ENGLISH; partly in FRENCH Presented at the Fluid Dyn. Panel Symp., Rome, 3-6 Sep. 1974

(AGARD-CP-150) Avail: NTIS HC $10.50 CSCL 01A

The proceedings are reported of the Fluid Dynamics Panel Symposium held in Rome. Research on airframe/propulsion interference, and the design of combat and transport aircraft were discussed. For individual titles, see N75-23486 through N75-23513.

N75-23486 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

INTERACTION PROBLEMS BETWEEN AIR INTAKES AND AIRCRAFT [PROBLEMES D'INTERACTIONS ENTRE LA PRISE D'AIR ET L'AVION]

Jacky Leynaert *In* AGARD Airframe/Propulsion Interference Mar. 1975 11 p refs In FRENCH (For availability see N75-23485 15-02)

The definition of the interaction terms between the air intake and the airframe, and the theoretical and experimental tools used to study the problem for subsonic or supersonic aircraft are presented. Some examples of the influence of a nonuniform upstream flow on the internal flow characteristics of supersonic intakes are given, and some means of adjusting the inlet to a nonuniform flow, mainly for flight with incidence or yaw, are analyzed. Author

N75-23487 Northrop Corp., Hawthorne, Calif.

A CRITERION FOR PREDICTION OF AIRFRAME INTEGRATION EFFECTS ON INLET STABILITY WITH APPLICATION TO ADVANCED FIGHTER AIRCRAFT

Gordon R. Hall *In* AGARD Airframe/Propulsion Interference Mar. 1975 15 p refs (For availability see N75-23485 15-02)

A simple criterion for the prediction of the effects of aircraft external flow field on installed inlet stability is presented. Wind tunnel data obtained from model tests of an advanced fighter aircraft are used to provide a base for discussion of installed inlet instability and to demonstrate the instability criterion. Specifically, two sources of supersonic inlet instability are identified, the instability mechanism is discussed and an instability criterion is defined, and application of the criterion is demonstrated. The sources of instability include ingestion of separated fuselage boundary layer at high aircraft attitude and ingestion of a vortex generated by a wing leading edge extension at negative attitude. A common stability criterion accounting for the effect of freestream Mach number, aircraft attitude, and inlet mass flow ratio is postulated and confirmed by available data. This same criterion is discussed in relation to observed cases of subsonic inlet instability and inlet instability resulting from slipstream ingestion. Application of the criterion to evaluate the effects of configuration changes on inlet stability boundaries is demonstrated. Author

N75-23488 Aircraft Research Association, Ltd., Bedford (England).

THE MEASUREMENT OF THE TRANSONIC SPILLAGE DRAG OF A SUPERSONIC INTAKE

S. A. M. Thornley and E. C. Carter *In* AGARD Airframe/Propulsion Interference Mar. 1975 13 p refs (For availability see N75-23485 15-02)

The technique is described in current use at the Aircraft Research Association for the measurement of the transonic spillage drag of a two dimensional, ramp intake. The method requires the calibration of the intake duct system for both mass flow and exit momentum. The technique is equally applicable to supersonic testing. The achieved repeatability of the measurements allows intake configuration differentiation to + or - 1% in aircraft drag for a typical supersonic fighter aircraft at high subsonic speed. Theoretically based calculations show satisfactory agreement with the measurements both for a range of intake mass flow and for intake ramp angle changes. The technique is economical and suitable for routine testing. General comments on the merits of methods available for the measurement of spillage drag using the balance mounted and whole model technique are presented together with recommendations for further technique development. Author

N75-23489 Grumman Aerospace Corp., Bethpage, N.Y.

AN EXPERIMENTAL INVESTIGATION OF THE COMPONENT DRAG COMPOSITION OF A TWO-DIMENSIONAL INLET AT TRANSONIC AND SUPERSONIC SPEEDS

Clifton J. Callahan *In* AGARD Airframe/Propulsion Interference Mar. 1975 16 p refs (For availability see N75-23485 15-02)

An experimental study was performed to establish the separate drag force contributions of the principal components of a rectangular, two-dimensional, external compression type, supersonic air induction inlet system. Concurrently, inlet system performance was measured in terms of engine face total pressure recovery and spacial flow distortion, and the possibility for tradeoff between inlet system drag and performance was explored. A scale model of the forebody, including air inlet and duct systems, of an advanced, twin engine, strike aircraft was employed for

the study. The wind tunnel model arrangement utilized a dual-balance technique to measure forebody and the inlet forces separately. The effects on the air induction system and vehicle forebody due to inlet component changes and varying propulsion air flow requirement were identified. The major inlet variables in the investigation included cowling lip and sidewall geometries, boundary layer bleed and air bypass exhaust configuration, and compression surface deflection schedule. The wind tunnel testing was conducted in closed circuit, continuous flow test facilities over a full range of supersonic and transonic speeds and representative ranges of vehicle angles of attack and sideslip. Three significant aspects of the program are addressed: inlet and vehicle configuration integration, wind tunnel model arrangement for force data measurement, and measured drag and performance results. These data can be broadly divided according to cowling, side wall, and bleed/bypass effects, in order to display major trends in drag and performance for the investigated transonic and supersonic speed regimes. Author

N75-23490 National Aerospace Lab., Amsterdam (Netherlands).
JET INTERFERENCE OF A PODDED ENGINE INSTALLATION AT CRUISE CONDITIONS
B. Munniksma and F. Jaarsma *In* AGARD Airframe/Propulsion Interference Mar. 1975 16 p refs (For availability see N75-23485 15-02)

The results of an experimental wind tunnel test program on the wing-pylon-bypass engine combination of the Airbus A 300 B airplane are presented. Only aerodynamic interference due to the engine jet was considered. For determining the interference drag due to the engine jet as well as to have the possibility to extrapolate the test results from model reference conditions to full scale a test scheme was developed. To prove the validity of the assumptions of this scheme several intermediate steps were made. As the engine jet-airframe interference is mutual, also effects of the external flow on the internal engine nozzle flow causing engine shifting has to be considered. In order to estimate the magnitude of this influence of the external flow field a two-dimensional model of the fan nozzle has been tested using an optical technique. From these tests the specific features of the fan nozzle flow field ranging from subcritical via supercritical to choked conditions are described. Author

N75-23491 Avions Marcel Dassault-Breguet Aviation, Saint-Cloud (France).
EFFECT OF EXTERNAL CONDITIONS ON THE FUNCTIONING OF A DUAL FLOW SUPERSONIC NOZZLE [EFFET DES CONDITIONS EXTERIEURES SUR LE FONCTIONNEMENT D'UNE TUYERE SUPERSONIQUE DOUBLE-FLUX]
Guy DeRichemont and J. Delery (Office Natl. d'Etudes et de Rech. Aerospatiales, Paris) *In* AGARD Airframe/Propulsion Interference Mar. 1975 14 p refs In FRENCH; ENGLISH summary (For availability see N75-23485 15-02)

The design of versatile military aircraft implies a very careful study of the propulsion system, taking into account interferences with the external flow. A possible solution to this difficult problem of adaptation is that of a dual flow system consisting of two nozzles with variable sections. Flow regimes where the primary jet impiges on the secondary nozzle are considered. The evolution is analyzed of the phenomena when the external pressure and the distance between primary injector exhaust plane and the nozzle exit are varied. This experimental study shows the influence of the external conditions upon the functioning of the nozzle. Theoretical methods are given which allow a reasonable prediction of nozzle performance under such conditions. Author

N75-23492 LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
SUBSONIC BASE AND BOATTAIL DRAG, AN ANALYTICAL APPROACH
J. K. Quermann *In* AGARD Airframe/Propulsion Interference Mar. 1975 12 p refs (For availability see N75-23485 15-02)

Methods of subsonic potential flow were applied to the calculation of base and boattail drag. For configurations with a base the Korst method was extended to subsonic flow by incorporating a standard family of free streamline shapes and a semi-empirical scheme for selecting the total pressure on the dividing streamline. The potential flow around the shape defined by the body, free streamline, and jet establishes the base and boattail pressures. Significant parts of the drag associated with the base actually appear on the boattail. In the absence of a base, the effect of the jet shape is felt by the boattail. With an underexpanded supersonic jet a portion of the thrust which would otherwise be lost in external expansion is recovered on the boattail. The fraction recovered drops rapidly with increasing jet pressure ratio. Results are compared with flight and wind tunnel tests on the Vought A-7 Airplane. Author

N75-23493 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
THEORY OF MIXING FLOW OF A PERFECT FLUID AROUND AN AFTERBODY AND A PROPULSIVE JET [COUPLAGE ENTRE L'ECOULEMENT AUTOUR D'UN ARRIERE-CORPS ET LE JET PROPULSIF EN THEORIE DE FLUIDE PARFAIT]
Roland Maria Sube, Jean-Jacques Chattot, and Georges Gillon *In* AGARD Airframe/Propulsion Interference Mar. 1975 12 p refs In FRENCH; ENGLISH summary (For availability see N75-23485 15-02)

The interference effects between external and internal flows are examined in the framework of the inviscid flow theory. These phenomena are connected mainly with flows around afterbodies. Subcritical axisymmetrical interacting flows are studied. The computation of both internal and external flows is carried out using a finite element method. The results make it possible to determine the shape of the jet using a pseudo-hodographic method, with an iterative procedure. The interference effects of a supersonic internal flow with subsonic or transonic external flows are considered. The supersonic internal jet is computed using the method of characteristics. The coupling conditions between the internal and the external flows are taken into account, using an iterative procedure in a way similar to that proposed by Young, but extended to compressible external flows. A comparison with existing experimental results is presented. Author

N75-23494 New York Univ., N.Y. Aerospace Lab.
LOW SPEED INJECTION EFFECTS ON THE AERODYNAMIC PERFORMANCE AT TRANSONIC SPEED
Renzo Piva *In* AGARD Airframe/Propulsion Interference Mar. 1975 10 p refs Prepared jointly with Rome Univ. (For availability see N75-23485 15-02)
(Grant AF-AFOSR-72-2167)

The problem concerning the possible reduction of the transonic drag for a high speed airplane was studied to enhance the aerodynamic performance at low altitudes when the drag must be minimized. Attention was focused on decreasing the drag forces on the aft portion of the vehicle. An experimental investigation was conducted to determine the effect, on afterbody drag, of the injection of a small amount of air spilled from the propulsive system, having low stagnation pressure, in the rear of the model. The purpose of this injection was to avoid overexpansion of the flow and to increase the average pressure on the aft section. The main problem to be investigated is where the injection is most effective and the amount of air required to avoid downstream reattachment. Some results are presented. It was found that the required amount of air is relatively low, because of the high sensitivity of the interaction region to any small change in the flow regime. Author

N75-23495 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Melun (France).
RESEARCH ABOUT EFFECTS OF EXTERNAL FLOW AND AIRCRAFT INSTALLATION CONDITIONS ON THRUST REVERSERS PERFORMANCES
J. M. Hardy and J. P. Carre *In* AGARD Airframe/Propulsion Interference Mar. 1975 11 p In FRENCH; ENGLISH summary (For availability see N75-23485 15-02)

Development of thrust reversers is generally carried out in engine test cells without external flow. As thrust reversers deviate a significant amount of flow this modifies the aerodynamic field surrounding an aircraft. Inversely, flight speed as well as aircraft installation conditions react on the operating characteristics of thrust reversers. This interaction is contingent on the thrust reversers design arrangement. The interaction mechanisms is analyzed using test data collected with two types of thrust reversers during an investigation carried out on the CONCORDE

afterbody. The differences in behavior existing between the reversers are shown as revealed by tests carried out with no external flow, and with external flow in the O.N.E.R.A. wind tunnel installation. An investigation on interaction mechanisms is presented, bringing out a correlation parameter which makes it possible to extrapolate thrust reverser results obtained in static conditions for various running configurations. A balance of deceleration forces are analyzed, and the effects of flight Mach number on the reversers base pressure values are shown.
Author

N75-23496 British Aircraft Corp. (Operating) Ltd., Bristol (England). Commercial Aircraft Div.
REVERSE THRUST EXPERIENCE ON THE CONCORDE
A. C. Willmer and R. L. Scotland *In* AGARD Airframe/Propulsion Interference Mar. 1975 15 p refs (For availability see N75-23485 15-02)

Reverse thrust is used as a means of deceleration on many aircraft. Partical limitations to its use are set by the following airframe/propulsion interference of hot gas ingestion, and aircraft handling. The reverse thrust force may also differ from that measured on a test bed due to interference. Model tests to determine these interference effects for the Concorde aircraft were carried out. The several test techniques used are described, the model results are compared with those inferred from tests on the prototype and production aircraft. Author

N75-23497 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
REYNOLDS NUMBER EFFECTS ON FORE- AND AFTBODY PRESSURE DRAG
Felix Aulehla and Geert Besigk *In* AGARD Airframe/Propulsion Interference Mar. 1975 15 p refs (For availability see N75-23485 15-02)

As analysis of a wind tunnel investigation at Mach number 0.8 on a series of axisymmetric bodies showed as a main result that varying Reynolds number produces opposite changes in pressure drag on fore- and aftbody, respectively. It is explained that this result could very well be caused by wind tunnel interference. As a consequence, to determine aftbody drag correctly it will be required either to test in interference free wind tunnels or to take into account the compensating effects on the forebody. Furthermore, it is pointed out that modifications in aftbody geometry affect forebody drag. Results from the commonly used aftbody test rigs with forebodies fixed to the ground therefore need appropriate corrections. Finally, the sensitivity of drag components with respect to the location of split lines is discussed. It is shown that subdividing the boattail is not advisable from an accuracy point of view. Author

N75-23498 Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
THE SUBSONIC BASE DRAG OF CYLINDRICAL TWIN-JET AND SINGLE-JET AFTERBODIES
J. Reid, A. R. G. Mundell, and J. F. W. Crane *In* AGARD Airframe/Propulsion Interference Mar. 1975 13 p refs (For availability see N75-23485 15-02)

The effect was studied of forebody and support interference on the base drag of cylindrical twin-jet afterbodies in wind tunnel tests at subsonic speeds. Two almost identical afterbodies were tested, one in a strong interference field and the other nearly free from interference. The results illustrate the importance of the effect and also serve to test two methods of correction. Supplementary tests show that the base drag of a cylindrical twin-jet afterbody tends to be a slightly greater than that of the equivalent axisymmetric configuration. Finally, a method of correlation is described whereby the base drag of both twin-jet and single-jet models may be expressed in linear form. Author

N75-23499 Tennessee Univ. Space Inst., Tullahoma.
ON SOME PROBLEMS ENCOUNTERED IN A THEORETICAL STUDY OF THE EXTERNAL FLOW OVER A NOZZLE CONFIGURATION IN TRANSONIC FLIGHT
T. H. Moulden, J. M. Wu, and D. J. Spring (Army Missile Command) *In* AGARD Airframe/Propulsion Interference Mar. 1975 12 p refs (For availability see N75-23485 15-02)
(Contract DAAH01-74-C-0183)

Attention is drain to the lack of information, both experimental and theoretical, concerning the transonic flow over an engine configuration operating at various thrust levels. It is shown that the flow is of great complexity. In particular, when the free stream Mach number is just supersonic, it is found that the confluence between the jet and the external flow is still more nearly subsonic in nature. This observation implies that the usual theories for supersonic base flow are not applicable to this situation. Calculations from such a theory are presented and discussed in the light of experimental evidence. It is recommended that considerable effort be spent in developing theoretical tools based upon solutions to more exact equations and that more fundamental experiments be performed. Author

N75-23500 Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
TWIN JET EXHAUST SYSTEM TEST TECHNIQUES
Ronald J. Glidewell and Arthur E. Fanning *In* AGARD Airframe/Propulsion Interference Mar. 1975 11 p refs (For availability see N75-23485 15-02)

The problem of integrating airframe and propulsion system requires that the various wind tunnel models, used in accomplishing the task, simulate as accurately as possible the internal and external flowfields that will be experienced on the airplane itself. This is particularly true for those models which are tested to define inlet and exhaust system interactions with the airplane flowfield. Exact simulation is, however, prohibited by the limitations of wind tunnel test techniques. For the jet effects model, such limitations include the interference effects associated with the model support system, exhaust plume simulation and the use of inlet fairings in substitution for flowing inlets. Information from a variety of sources is used to assess the impact of these model limitations on the accuracy of afterbody performance measured on twin jet models. Author

N75-23501* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN EXPERIMENTAL STUDY OF JET EXHAUST SIMULATION
William B. Compton, III *In* AGARD Airframe/Propulsion Interference Mar. 1975 11 p refs (For availability see N75-23485 15-02)
Avail: NTIS CSCL 01A

Afterbody drag predictions for jet aircraft are usually made experimentally with the jet exhaust flow simulated. The physical gas properties of the fluid used for the model jet exhaust can affect the accuracy of simulation of the airplane's jet exhaust plume. The effect of the accuracy of this simulation on afterbody drag was investigated by wind-tunnel tests with single engine model. In addition to unheated air as the exhaust gas, the decomposition products of three different concentrations of hydrogen peroxide were utilized. The air jet simulation consistently resulted in higher boattail drag than hydrogen peroxide simulation. The differences in drag for the various exhaust gases are attributed to different plume shapes and entrainment properties of the gases. The largest differences in drag due to exhaust gas properties were obtained for the combination of high transonic Mach numbers and high boattail angles. For these conditions, the current data indicate that the use of air to simulate a nonafterburning turbojet exhaust can result in an increase in afterbody amounting to 20 percent of the nonafterburning turbojet value. Author

N75-23502 Rolls-Royce, Ltd., Derby (England). Installation Aerodynamics Section.
A MODEL TECHNIQUE FOR EXHAUST SYSTEM PERFORMANCE TESTING
T. D. Coombes *In* AGARD Airframe/Propulsion Interference Mar. 1975 12 p refs (For availability see N75-23485 15-02)

An accurate model technique is described that was developed to measure the sum of gross thrust and afterbody drag for nozzle systems with single or two co-axial streams. The rig uses air at ambient temperature and is designed to operate in the 9ft x 8ft transonic wind tunnel of the Aircraft Research Association Limited at Bedford. Model test results are also presented to demonstrate the accuracy and repeatability of the rig and show the considerable progress that has been made in advancing the state of the art on exhaust systems for low specific thrust engines. Author

N75-23503 LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.

ISOLATING NOZZLE AFTERBODY INTERACTION PARAMETERS AND SIZE EFFECTS: A NEW APPROACH

S. C. Walker *In* AGARD Airframe/Propulsion Interference Mar. 1975 8 p refs (For availability see N75-23485 15-02)

A flight test of the A-7E airplane is reported along with associated wind tunnel tests comprising approximately one half of the long range program. The difficulty of controlling parameters in flight was overcome by flying into the data point while allowing only slight variations in ambient pressure. Wind tunnel tests were made in a 1.2 x 1.2 meter blowdown tunnel. Models were run with both hot and cold exhaust. One model was a wingless body of revolution; the second was a geometric representation of the airplane. The flight test demonstrated the practicability of parameter control testing, and showed applicability of stream thrust parameter to inflight engine performance evaluation. Wind tunnel data show trends and general levels comparable to flight, and have verified some areas in which development of corrections is necessary. Author

N75-23504 ARO, Inc., Arnold Air Force Station, Tenn.

EXHAUST PLUME TEMPERATURE EFFECTS ON NOZZLE AFTERBODY PERFORMANCE OVER THE TRANSONIC MACH NUMBER RANGE

C. E. Robinson, M. D. High, and E. R. Thompson *In* AGARD Airframe/Propulsion Interference Mar. 1975 16 p refs Sponsored in part by AEDC (For availability see N75-23485 15-02)

Results of an experimental research investigation on nozzle/afterbody drag are presented. Experimental afterbody (and boattail) drag coefficients and pressure distributions are discussed for an isolated, strut-mounted nozzle/afterbody model for the Mach number range from 0.6 to 1.5. The experimental data were obtained for the basic model with an air-cooled and a water-cooled ethylene/air combustor to provide hot-jet duplication as well as cold-jet simulation. The temperature of the nozzle exhaust gas was varied from 530 R (294.4 K) (burner-off) to approximately 2500 R (1388.9 K) for several nozzle pressure ratios from jet-off to those corresponding to a moderately under-expanded exhaust plume. The differences between the cold-jet and hot-jet results are significant, and adjusting the cold-jet pressure ratio to correct for the changes in the jet specific heat ratio with temperature will account for most of the differences observed. Author

N75-23505 Boeing Co., Wichita, Kans.

THE INFLUENCE OF NACELLE AFTERBODY SHAPE ON AIRPLANE DRAG

Walter J. Rohling *In* AGARD Airframe/Propulsion Interference Mar. 1975 14 p refs (For availability see N75-23485 15-02)

A program to design and flight test quiet nacelles suitable for installation on JT3D powered 707 airplanes was conducted. Design requirements for the quiet nacelle stated that the nacelle shall be flightworthy, flight weight, capable of being certificated to airworthiness standards, and appropriate to the aircraft type. The cruise performance flight tests and the additional performance diagnostic flight tests indicated an unnecessary performance penalty due to the nonoptimum aft translating sleeve and fan nozzle configuration. An unfavorable angle-of-attack-sensitive interplay between the wing and nacelle aft sleeve flow fields was found at all cruise Mach numbers. This penalty was the only significant item discovered during the flight test program which required correction to provide a viable retrofit nacelle configuration. The diagnostic performance flight tests, wind tunnel and exhaust system model tests are described that were conducted to define the required change and to obtain data on the cruise performance benefits that resulted from the change. Author

N75-23506* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

REYNOLDS NUMBER EFFECTS ON BOATTAIL DRAG OF EXHAUST NOZZLES FROM WIND TUNNEL AND FLIGHT TESTS

Fred A. Wilcox and Roger Chamberlin *In* AGARD Airframe/Propulsion Interference Mar. 1975 15 p refs (For availability see N75-23485 15-02)

Avail: NTIS CSCL 01A

A family of nacelle mounted high angle boattail nozzles was tested to investigate Reynolds number effects on drag. The nozzles were flown on a modified F-106B and mounted on scale models of an F-106 in a wind tunnel. A 19- to 1-range of Reynolds number was covered as a result of the large size differences between models and by flying over a range of altitude. In flight the nozzles were mounted behind J-85 turbojet engines. Jet boundary simulators and a powered turbojet engine simulator were used on the wind tunnel models. Data were taken at Mach numbers of 0.6 and 0.9. Boattail drag was found to be affected by Reynolds number. The effect is a complex relationship dependent upon boundary layer thickness and nozzle boattail shape. As Reynolds number was increased from the lowest values obtained with scale models, boattail drag first increased to a maximum at the lowest flight Reynolds number and then decreased. Author

N75-23507 Boeing Aerospace Co., Seattle, Wash.

ACCOUNTING OF AERODYNAMIC FORCES ON AIRFRAME/PROPULSION SYSTEMS

Michael E. Brazier and William H. Ball *In* AGARD Airframe/Propulsion Interference Mar. 1975 15 p refs (For availability see N75-23485 15-02)

Proper accounting, prediction, and measurement of propulsion system installation corrections are essential for the successful development of advanced military aircraft. The results are reported of recent studies which evaluate the methods used to predict, measure and integrate the aerodynamic and propulsion forces within a force accounting procedure that provides maximum element visibility and accuracy, and is applicable throughout an entire airplane development cycle. Improved analysis techniques are described which provide more comprehensive and accurate predictions of inlet performance and nozzle/aftbody drag early in the preliminary design process. Inlet analysis techniques make use of standardized data maps for obtaining complete inlet performance characteristics. Nozzle/aftbody drag calculations are performed using a newly-developed truncated integral mean slope technique. Effects of strut interference, blockage, model split-line locations and other factors which introduce uncertainties into airframe/propulsion system data are presented. Author

N75-23508 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

AIRFRAME/PROPULSION SYSTEM FLOW FIELD INTERFERENCE AND THE EFFECT ON AIR INTAKE AND EXHAUST NOZZLE PERFORMANCE

G. K. Richey, L. E. Surber, and J. A. Laughrey *In* AGARD Airframe/Propulsion Interference Mar. 1975 31 p refs (For availability see N75-23485 15-02)

The interference between the airframe flow field and the internal/external flow in the air intakes and exhaust nozzles of high performance tactical aircraft is shown to have a significant impact on the performance and operating characteristics of these components, and hence on overall aircraft performance. The internal flow characteristics of an inlet system closely integrated with the airframe are strongly influenced by flow field nonuniformities generated by the airframe forebody and wing, particularly at the higher angles of attack or yaw which modern tactical aircraft are capable of. Comparisons are made of the inlet ambient (capture plane) flow field, and pressure recovery, steady state and dynamic inlet distortion at the simulated engine compressor face for both integrated (side mounted and fuselage or wing-shielded) and isolated inlet systems to quantitatively assess the airframe interference effects. For the engine exhaust nozzles of closely integrated propulsion system/airframe configurations, the major influence of the airframe flow field is associated with the alteration of the viscous and inviscid external flow in the nozzle region, and its effect on external aftbody/nozzle drag. A detailed discussion, supported by experimental data, shows the effects on airframe aftbody/nozzle pressure distributions and nozzle installed performance with respect to twin jet interference, wing flow, aircraft tail/control surfaces, interfairings and free stream flow conditions. Author

N75-23509 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).

DETAILED EXPERIMENTAL AND THEORETICAL ANALYSIS OF THE AERODYNAMIC INTERFERENCE BETWEEN

LIFTING JETS AND THE FUSELAGE AND WING
G. Schulz and G. Viehweger *In* AGARD Airframe/Propulsion Interference Mar. 1975 13 p refs (For availability see N75-23485 15-02)

An aircraft model of simple shape for pressure distribution measurements is used, which allows the variation of all main geometrical parameters. The jets reach Mach number 1. Measurements of the velocity directional flow field are added. The pressure distributions as well as the flow directional field allow the physical interpretation of the several aerodynamic effects. By integration of the pressure field, the forces and moments caused by the jets are obtained. The integration of the directional field leads to the stream lines of the complicated field of cross blown jets. Theoretical momentum considerations enable the calculation of the jet path and lead to transcalculation rules for flow directional fields (downwash) from one dynamic pressure ratio to another. Author

N75-23510 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
PREDICTION OF THE OPTIMUM LOCATION OF A NACELLE SHAPED BODY ON THE WING OF A WING-BODY CONFIGURATION BY INVISCID FLOW ANALYSIS
S. R. Ahmed *In* AGARD Airframe/Propulsion Interference Mar. 1975 12 p refs (For availability see N75-23485 15-02)

Some results of a basic study are presented which aims at the prediction of optimum location of a pylon-mounted engine nacelle on the wing of a wing-body configuration with the help of inviscid flow analysis. The options considered are the underwing and overwing positions of the nacelle. Varied parameters are its spanwise and chordwise location along the wing. The criterion for the choice of the optimum location is the minimum possible induced drag of the wing-body-pylon-nacelle configuration. The theoretical calculation of the inviscid flow is done by the so-called 'panel method'. Feasibility of these predictions for subcritical flow is checked on the basis of extensive pressure and force measurements in a wind tunnel. Author

N75-23511 Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
AIRFRAME: ENGINE INTERACTION FOR ENGINE CONFIGURATIONS MOUNTED ABOVE THE WING. PART 1: INTERFERENCE BETWEEN WING AND INTAKE JET
G. Krenz *In* AGARD Airframe/Propulsion Interference Mar. 1975 32 p refs (For availability see N75-23485 15-02)

Advanced technology of airframe-propulsion-integration confirm the feasibility for over-the-wing engine installation of transport aircraft. Basic areas of interaction between wing and engine flows are described together with specific investigations associated with fore and aft engine locations. For the aft location, W/T results are presented with flight test data including stall and high speed flight characteristics. Further, low speed tunnel investigations of aircraft configurations with engine intakes well in front of wing L.E., result in increasing lift as well as improving the lift/drag ratio during T/O and landing. A theoretical approach was conducted, using the well established panel method, and comparison of theoretical and experimental pressure distributions proved well for spacing of one nozzle diameter between the wing and nozzle-jet sheet. Author

N75-23512 Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
AIRFRAME: ENGINE INTERACTION FOR ENGINE CONFIGURATIONS MOUNTED ABOVE THE WING. PART 2: ENGINE JET SIMULATION PROBLEMS IN WIND TUNNEL TESTS
B. Ewald *In* AGARD Airframe/Propulsion Interference Mar. 1975 17 p refs (For availability see N75-23485 15-02)

A test technique developed for the VFW-Fokker low speed wind tunnel is presented. In this technique the airframe model is mounted to the external mechanical balance (wire suspension). The engine pod is mounted separately on a tail sting suspension system. Due to the design of this tail sting system its angle of attack axis of rotation coincides with the corresponding axis of the external balance. So separate mounting of airframe and engine with very small gaps is possible. The air is fed to the engine pod with high pressure (up to 20 atmospheres). This pressure is decreased to the required nozzle exit pressure ratio by perforated plates very close to the nozzle exit. Calibration results of this nozzle arrangement are given. Typical test results (force measurements, wing pressure distribution) are presented for several engine locations (over-wing, on-wing, under-wing). Author

N75-23513 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
AERODYNAMIC ASPECTS AND OPTIMISATION OF THRUST REVERSER SYSTEMS
Kurt Lotter and Wolfgang Kurz *In* AGARD Airframe/Propulsion Interference Mar. 1975 22 p ref (For availability see N75-23485 15-02)

The present generation of commercial aircraft and future advanced military aircraft require thrust reversal for reduction of landing distances, especially for wet or icy runways. The various design and integration features for jet deflection are summarized, and the requirements and problem areas discussed under special consideration of a target type reverser system. The important engine/airframe interference problems and aerodynamic aspects associated with thrust reversal are considered. Parametric investigation of thrust reverser geometry on efficiency, reingestion structure heating and longitudinal stability during ground roll is presented. Results are based on an intensive wind tunnel test program using various types of scale models with cold and hot jets, intake suction and fixed and moving ground simulation. Emphasis is given to the overall optimization of often conflicting requirements from parameters like for example thrust reverser performance and reingestion. The essential influence of appropriate thrust reverser operation and landing techniques at or shortly before touch-down on landing distance is shown. Author

N75-23514*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF WING PLANFORM AND CANARD LOCATION AND GEOMETRY ON THE LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A CLOSE-COUPLED CANARD WING MODEL AT SUBSONIC SPEEDS
Blair B. Gloss Washington Jun. 1975 86 p refs
(NASA-TN-D-7910; L-9987) Avail: NTIS HC $4.75 CSCL 01A

A generalized wind-tunnel model with canard and wing planforms typical of highly maneuverable aircraft was tested in the Langley 7- by 10-foot high-speed tunnel at a Mach number of 0.30 to determine the effect of canard location, canard size, wing sweep, and canard strake on canard-wing interference to high angles of attack. The major results of this investigation may be summarized as follows: the high-canard configuration (excluding the canard strake and canard flap), for both the 60 deg and 44 deg swept leading-edge wings, produced the highest maximum lift coefficient and the most linear pitching-moment curves; substantially larger gains in the canard lift and total lift were obtained by adding a strake to the canard located below the wing chord plane rather than by adding a strake to the canard located above the wing chord plane. Author

N75-23515*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VIKING ENTRY VEHICLE AERODYNAMICS AT M EQUALS 2 IN AIR AND SOME PRELIMINARY TEST DATA FOR FLIGHT IN CO2
Robert I. Sammonds and Robert L. Kruse Washington Jun. 1975 26 p refs
(NASA-TN-D-7974; A-4825) Avail: NTIS HC $3.75 CSCL 01A

The static and dynamic aerodynamic characteristics of the Viking entry vehicle were determined experimentally in free flight in air at a Mach number near 2. Preliminary results were also obtained in CO2 at M infinity = 11. The low speed tests in air confirmed a region of dynamic instability previously observed. The instability was greatest at the smallest pitch amplitudes but decreased with increasing amplitude until a limit cycle was reached at about 8 deg. The tests in CO2 indicated increased drag coefficients of 3 percent with respect to those in air. Errors in the drag coefficient of this magnitude would significantly affect the reconstruction of the Martian atmosphere during entry of the Viking spacecraft. Author

N75-23516# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
UNSTEADY BEHAVIOR OF TRANSONIC FLOWS
Gerd E. A. Meier 1974 138 p refs In GERMAN; ENGLISH summary
(MPIS-Mitt-59) Avail: NTIS HC $5.75; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. 26,40 DM

Transonic flows in a curved tunnel, on wings, and in Laval-type nozzles were investigated. They show similar nonsteady behavior where fluctuation of quantities of state occur which are more than 10 percent. The oscillation is generated by a local instability, which is based on an interaction of the boundary layer and the shock wave at the end of the supersonic flow regime. Using a one-dimensional treatment of the steady nozzle flow, one can establish an essential criterion for the occurrence of the instability of the shock induced separated flow. The frequency of the oscillations is determined by several propagation processes. The change in boundary conditions caused by displacement of the separation is propagated into the main flow field by the speed of sound and flow velocity. Changes in the back-flow regime are propagated mainly with the flow and back-flow velocity. From this experimental evidence, oscillation periods can be estimated for all cases which are experimentally observed. Author (ESRO)

N75-23517# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF THE AXISYMMETRIC SHAPED HYPERSONIC NOZZLES
I. I. Mezhirov, T. A. Timofeyeva, and Yu. I. Chistov 23 Jan. 1975 30 p refs Transl. into ENGLISH from Tsent. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 2, no. 6, 1971 p 1-8
(AD-A007471; FTD-MT-24-436-75) Avail: NTIS CSCL 20/4

The viscosity effect on the uniform flow of air was studied in the nozzles which were designed to obtain the exit characteristics of the airflow. It was found that the axisymmetric hypersonic nozzles provide a satisfactory flow. F.O.S.

N75-23518# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACCOUNT OF SHEARING STRAIN DURING THE CALCULATION OF THE OSCILLATIONS OF LOW ASPECT-RATIO WING BY THE METHOD OF POLYNOMIALS
V. G. Bunkov 18 Feb. 1975 33 p refs Transl. into ENGLISH from Uch. Zap., Tsent. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 4, 1972 p 111-119
(AD-A007397; FTD-MT-24-0557-75) Avail: NTIS CSCL 01/1

The application of the polynomial method to the calculation of oscillation and flutter for short wing aspect ratios is discussed. The method is described as a generalization of Ritz's method with the expansion of deformation in power series. Author

N75-23519# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INTERACTION OF SHOCK WAVE WITH WEDGE, WHICH MOVES AT SUPERSONIC SPEED
R. Ya. Tugazakov 12 Feb. 1975 24 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 2, 1971 p 34-39
(AD-A007302; FTD-MT-24-0343-75) Avail: NTIS CSCL 01/1

The problem of incidence during shock wave interaction with a wedge moving at supersonic speed was examined along with flow when bow shock pressure and incident shock are identical. Gas parameters in the interaction wave region were calculated using the method of characteristics. Author

N75-23520# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
REPRODUCTION OF THE INTERACTION OF AERODYNAMIC LOADS AND STRUCTURAL DISTORTIONS DURING STRENGTH TESTS
G. N. Zamula and P. V. Miodushevskii 24 Jan. 1975 26 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 3, no. 4, 1972 p 158-163
(AD-A007661; FTD-MT-24-0564-75) Avail: NTIS CSCL 01/1

The simulation of the interaction of aerodynamic loads and structural deformation is discussed for testing structural strength. Author

N75-23521# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF THE OPTIMIZATION OF THE LOAD-CARRYING STRUCTURE OF WING ON RIGIDITY DURING VARIATION BY THE DISTRIBUTION OF THICKNESS RATIO
G. V. Ukraintsev and V. M. Frolov 27 Jan. 1975 34 p Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 3, no. 4, 1972 p 65-76
(AD-A007317; FTD-MT-24-0553-75) Avail: NTIS CSCL 01/1

A method proposed for the optimization of the load carrying structure of a wing is discussed. The procedure will determine the greatest flexual rigidity variation as a function of relative thickness of the power material under conditions of weight constancy and satification of some aerodynamic limitations. Author

N75-23522# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
FLIGHT TEST FOR THE FEASIBILITY EVALUATION OF THE CHADWICK ELECTRONIC WEIGHING SYSTEM (CHEWS) Final Report
William Bollinger and William Mawhinney 14 Jan. 1975 54 p refs
(AD-A007516; NADC-74234-30) Avail: NTIS CSCL 01/3

This report presents the procedures and results of the flight testing of the Chadwick Electronic Weighing System (CHEWS). The consensus of opinions from pilot questionnaires concerning the system is discussed. A more extensive flight test program is recommended. GRA

N75-23523# Naval Postgraduate School, Monterey, Calif.
AERODYNAMIC CHARACTERISTICS OF AN AXISYMMETRIC BODY UNDERGOING A UNIFORM PITCHING MOTION Final Report
Lloyd H. Smith and Robert H. Nunn Feb. 1975 99 p refs
(AD-A007553; NPS-59Nn75021) Avail: NTIS CSCL 16/2

An experimental investigation was conducted to determine the effect of a uniform pitching motion on a slender axisymmetric body while undergoing large excursions in angle of attack. Force and moment measurements were obtained for a slender tangent-ogive/cylindrical body over a range of Reynolds numbers from 50,000 to 140,000 while varying the angle of attack from zero to 90 deg and the pitch rate between zero and 281 deg per second. Smoke flow visualization studies were used as an aid in assessing wake vortex transitions. GRA

N75-23524# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF HEAT TRANSFER DURING FLOW AROUND UNCAMBERED DELTA WINGS WITH BLUNTED EDGES
N. A. Davydova and A. Ya. Yushin 8 Jan. 1975 34 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 1, 1970 p 117-125
(AD-A007316; FTD-MT-24-267-75) Avail: NTIS CSCL 01/1

Discrete calorimetric sensors were used along with heat sensitive paint to make heat transfer measurements of the supersonic flow around uncambered delta wings at various Mach numbers. The effect of angle of attack and degree of bluntness of the cyclindrical edges on heat transfer to the wing is investigated. It is shown that the available engineering methods of calculation of heat exchange can be utilized to evaluate heat transfer intensity on wing. Author

N75-23525# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF LOADS AND DEFORMATIONS OF SWEPTBACK WING WITH THE AID OF MECHANICAL ANALOG INSTRUMENTS
B. L. Merkulov 27 Jan. 1975 21 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 3, no. 5, 1972 p 119-123
(AD-A007308; FTD-MT-24-0544-75) Avail: NTIS CSCL 01/1

The possibility of applying mechanical analog instruments to the study of pressure distributions on the surface of a streamlined body, and to the calculation of elastic deformations of sweptback wings are examined. Approximation formulas are

proposed which determine the relationship between the aerodynamic coefficients of sections perpendicular to the axis of the wing, and the coefficients of sections parallel to the planes of symmetry of the aircraft. Author

N75-23526# Chrysler Corp., New Orleans, La. Data Management Services.
AN EXPERIMENTAL INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF SEVERAL NOSE MOUNTED CANARD CONFIGURATIONS AT SUPERSONIC MACH NUMBERS
James R. Burt, Jr. 30 Jan. 1975 621 p refs
(Contract DAAH03-74-C-0405; DA Proj. 1M2-62303-A-214)
(AD-A007793; DMS-AR-1023; RD-75-17) Avail: NTIS CSCL 16/4

Experimental aerodynamic investigations were conducted at the Ames 6- by 6-foot supersonic wind tunnel to determine the aerodynamic characteristics of several nose mounted canard wing configurations. Canard position, geometry, angular orientation, and model nose shape were varied systematically to determine their effects on model aerodynamics. The model was tested at angles of attack of -3 to 12 degrees and Mach Numbers of 1.5 and 2.0. Aerodynamic loads were measured separately on four canards and tail panels, and the total model. The vapor screen method was used to trace the paths of the vortices shed from the canards. GRA

N75-23527# Naval Intelligence Support Center, Washington, D.C. Translation Div.
WING LONGITUDINAL STABILITY CRITERIA
R. D. Irodov 13 Feb. 1975 19 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 1, no. 4, 1970 p 63-72
(AD-A007430; NISC-Trans-3631) Avail: NTIS CSCL 01/3

The longitudinal stability of a wing in ground effect machines is discussed in terms of aerodynamic configurations. Author

N75-23528# United Aircraft Corp., East Hartford, Conn. Research Labs.
PREDICTION OF ROTOR WAKE INDUCED FLOW ALONG THE ROCKET TRAJECTORIES OF AN ARMY AH-1G HELICOPTER Final Report, Dec. 1973 - Feb. 1975
Anton J. Landgrebe and T. Alan Egolf Mar. 1975 102 p refs
(Contract DAAA21-74-C-0195)
(AD-A007878; UARL-R911810-10; PA-TR-4797) Avail: NTIS CSCL 01/1

An analytical investigation was conducted to predict the rotor wake induced flow velocities along the trajectories of rockets fired from an Army AH-1G helicopter. Three components of both the time-averaged and instantaneous induced velocities were predicted at selected points along the trajectories of rockets fired from four wing locations. Three flight conditions with helicopter flight speeds of 0, 15, and 30 knots were investigated. GRA

N75-23529# Naval Intelligence Support Center, Washington, D.C. Translation Div.
HYDROAERODYNAMIC CHARACTERISTICS OF A LOW ASPECT RATIO DELTA WING NEAR A SCREEN
A. G. Kostin 14 Mar. 1975 10 p refs Transl. into ENGLISH from Gidrodinam. Bolshikh Skorostei (USSR), no. 5, 1968 p 113-120
(AD-A007649; NISC-Trans-3643) Avail: NTIS CSCL 01/1

An analytical theory was developed to obtain hydrodynamic coefficients of a low aspect ratio delta wing near a screen. The general representation of the potential velocity of the theory includes all known results as a zero approximation wing in plane parallel flow. Wing camber effects on the coefficients are studied. Author

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N75-23530# Rome Air Development Center, Griffiss AFB, N.Y.
FAA LIGHTNING PROTECTION STUDY: LIGHTNING PROTECTION REQUIREMENTS FOR AIL TYPE 55 K INSTRUMENT LANDING SYSTEM Final Report, 1 Jan. 1974 - 1 Jan. 1975
Richard H. Hu, Andrew W. Revay, Jr., and Richard M. Cosel Jan. 1975 45 p refs
(Contract DOT-FA72WAI-356)
(AD-A008931; FAA-RD-75-47) Avail: NTIS HC $3.75

The degree of susceptibility of the FAA AIL Type 55 K electronic instrument landing system to electromagnetic pulse effects due to lightning, and the devices and methods proposed to deal with the problem are examined. Lightning protection requirements, types of susceptible components, methods used to determine component withstand capabilities, and recommendations for specific protection devices and circurity are covered. Appendices include a bibliography of sources used for reference and complete circuit and block diagrams of the affected subsystems. Author

N75-23531# Mitre Corp., McLean, Va.
AN OVERVIEW AND ASSESSMENT OF PLANS AND PROGRAMS FOR THE DEVELOPMENT OF THE UPGRADED THIRD GENERATION AIR TRAFFIC CONTROL SYSTEM
Mar. 1975 225 p refs Revised
(Contract DOT-FA70WA-2448)
(AD-A008940; M73-237-Rev-1; FAA-EM-75-5) Avail: NTIS HC $7.50

Information on the scope, rationale, costs, schedules, and possible benefits of the air traffic control system being developed for operational use in the 1980's and into the 1990's is presented. The ATC system currently in use, is described and the need for improvements is identified. The goals and objectives of the upgrade system are discussed. Forecasts of future air traffic through 1975 are shown. The major features of the air traffic control system are traffic control system are discussed including need, objectives, technical description, benefits, major issues, implementation considerations, benefits, and schedules, major milestones, and resource requirements through FY83. The way in which each major feature contributes toward achieving the overall goals and objectives is discussed. Overall development costs are presented along with gross estimates of F&E costs. Author

N75-23532*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
PASSENGER DEMOGRAPHICS AND SUBJECTIVE RESPONSE TO COMMUTER AIRCRAFT IN THE NORTHEAST
David Noskowitz and Ira D. Jacobson Dec. 1974 23 p ref
(Grant NGR-47-005-181)
(NASA-CR-142876; MR-403219) Avail: NTIS HC $3.25 CSCL 01C

Results are compared for comfort and environmental studies taken in conjunction with a STOL program. Data were taken on flights of four different airlines, each flying different aircraft. Two of the lines are classified as commuter airlines flying between relatively close destinations. The aircraft involved are: the De Havilland Twin Otter, a Canadian aircraft; the French Nord 262; the Beechcraft 99 Airliner and the Sikorsky S-61 helicopter, both American. Author

N75-23533*# Scientific Translation Service, Santa Barbara, Calif.
HIGH-CAPACITY TRANSPORT PLANES AS MODERN AIR FREIGHT SYSTEMS
Helmuth M. Weiss Washington NASA Jun. 1975 15 p refs Transl. into ENGLISH from Forden und Heben. (West Germany), v. 22, no. 2, 1972 p 97-100
(Contract NASw-2483)
(NASA-TT-F-16396) Avail: NTIS HC $3.25 CSCL 01C

The development of large-capacity transport planes in the U.S. and U.S.S.R., with freight air containers, is seen as ushering in complete air freight systems with world-wide capacity. Recovery rates were observed in Swiss gravel mines to be raised by continuously operating bucket wheel type 100 dredges. Extensions and improvements were made to the type GK 81/UB 600 mobile crane, oil-hydraulic container elevators, and explosion-proof compressed-air hoists. Author

N75-23534*# Douglas Aircraft Co., Inc., Santa Monica, Calif.
ANALYSIS OF OPERATIONAL REQUIREMENTS FOR MEDIUM DENSITY AIR TRANSPORTATION. VOLUME 1: SUMMARY
Mar. 1975 166 p refs
(Contract NAS2-8135)
(NASA-CR-137603; MDC-J4484-Vol-1) Avail: NTIS HC $6.25 CSCL 01B

The medium density air travel market was studied to determine the aircraft design and operational requirements. The impact of operational characteristics on the air travel system and the economic viability of the study aircraft were also evaluated. Medium density is defined in terms of numbers of people transported (20 to 500 passengers per day on round trip routes), and frequency of service (a minumium of two and maximum of eight round trips per day) for 10 regional carriers. The operational characteristics of aircraft best suited to serve the medium density air transportation market are determined and a basepoint aircraft is designed from which tradeoff studies and parametric variations could be conducted. The impact of selected aircraft on the medium density market, economics, and operations is ascertained. Research and technology objectives for future programs in medium density air transportation are identified and ranked. Author

N75-23535# Peat, Marwick, Mitchell and Co., San Francisco, Calif.
SAINT LOUIS AVIATION FORECAST STUDY: TECHNICAL SUPPLEMENT
Dan G. Haney Sep. 1974 323 p
(Contract DOT-OS-40176)
(PB-239058/1; DOT-40176-4) Avail: NTIS HC $9.25 HC also available from NTIS $23.00/set of 4 reports as PB-239054-SET CSCL 01B

This technical supplement includes input data and detailed tabulations from the airport ground access analysis made in connection with forecasts of aviation activity pertinent to the St. Louis airport problem dated October 1974. GRA

N75-23536# Peat, Marwick, Mitchell and Co., San Francisco, Calif.
SAINT LOUIS AVIATION FORECAST STUDY: REVIEW OF PRIOR FORECASTS
Dan G. Haney Sep. 1974 122 p
(Contract DOT-OS-40176)
(PB-239057/3; DOT-40176-3) Avail: NTIS HC $5.25 HC also available from NTIS $23.00/set of 4 reports as PB-239054-SET CSCL 01B

Forecast methodologies are described, and an overview of existing forecasts as well as a detailed review of existing forecasts are presented. GRA

N75-23537# Peat, Marwick, Mitchell and Co., San Francisco, Calif.
SAINT LOUIS AVIATION FORECAST STUDY Final Report
Dan G. Haney Sep. 1974 303 p refs
(Contract DOT-OS-40176)
(PB-239056/5; DOT-40176-2) Avail: NTIS HC $9.25 HC also available from NTIS $23.00/set of 4 reports as PB-239054-SET CSCL 01B

The following topics are reported: (1) analysis and forecast of population and economic activity in St. Louis; (2) summary of historical aviation activity; (3) air carrier forecasts; (4) nonscheduled, charter, and international operations forecasts; (5) commuter air service forecasts; (6) military aviation forecasts; (7) analysis and forecast of general aviation activity; (8) detailed aircraft operations forecasts; (9) ground traffic forecasts; and (10) sensitivity analyses. GRA

N75-23538# Peat, Marwick, Mitchell and Co., San Francisco, Calif.
SAINT LOUIS AVIATION FORECAST STUDY: EXECUTIVE SUMMARY
Dan. G. Haney Sep. 1974 20 p
(Contract DOT-OS-40176)
(PB-239055/7; DOT-40176-1) Avail: NTIS HC $3.25 HC also available from NTIS $23.00/set of 4 reports as PB-239054-SET CSCL 01B

Forecasts of aviation activity are developed for the St. Louis region to the year 2000. Forecasts are presented on scheduled air carrier, commuter, general aviation, and other types of aviation activity for Lambert-St. Louis. General aviation forecasts of regionwide activity are also reported. Detailed forecasts of peak hour operations, VFR/IFR operations, and day/night operations are developed. Airport access traffic is also forecast. Sensitivity analyses are included on a number of future uncertainties. In general, the forecasts show significantly lower levels of growth than have been predicted in recent studies conducted for the airport authorities in St. Louis. GRA

N75-23539# Air Force Technical Applications Center, Washington, D.C. Foreign Technology Div.
EMERGENCY EJECTION, SEQUENCE OF OPERATION
3 Mar. 1975 17 p Transl. into ENGLISH from the monograph "Beskrivning och handhavande" Sweden
(AD-A007470; FTD-HC-23-0867-75) Avail: NTIS CSCL 01/3

The chair ejection sequence, and parachute deployment are given. Author

N75-23540# Operational Research and Analysis Establishment, Ottawa (Ontario).
ANALYSIS OF DISTRESS AIR CASES IN RELATION TO CRASH POSITION AND INTENDED TRACK: 1968 - 1973
R. P. Hypher, E. J. Edmond, and E. C. ONeill Aug. 1974 63 p
(AD-A007429; ORAE-R51) Avail: NTIS CSCL 01/3

In distress air cases in which an aircraft crashes or force lands without revealing its position, search methods are prescribed by Canadian Forces Search and Rescue Orders and Procedures (CFP 209). This paper examines the relationship between crash position and various parameters of the intended flight (Origin, or Last Known Position, Track and Destination). A method for determining the search area is devised and compared with the existing method embodied in CFP 209. The proposed method produces search areas which are smaller than the present areas for a corresponding probability of coverage. The overall reduction in areas is anticipated to be about 35% over a wide spectrum of cases and a period of time. On the assumption that search time is related to area, a reduction in search time of this order of magnitude is expected. GRA

N75-23541# Naval Air Development Center, Warminster, Pa.
A CRASHWORTHY ARMORED PILOT SEAT FOR HELICOPTERS Final Report
Bernard Mazelsky 18 Jan. 1974 131 p refs
(AD-A007551; NADC-74018-40; USAAVSCOM-TR-73-34) Avail: NTIS CSCL 01C

The accelerations which can occur during crashes of rotary- and light fixed-wing aircraft have been shown to be injurious or fatal to human occupants. Under a joint Army and Navy program, ARA, Inc. developed a crash survivable seat using Government Furnished Equipment in the form of an armored bucket, restraint system, and cushions. The seat system was designed to meet as many of the requirements of MIL-S-58095 (AV) within the physical limitations of existing space requirements in present helicopters. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N75-23542 Michigan Univ., Ann Arbor.
RANGE-DOPPLER IMAGING OF ROTATING OBJECTS Ph.D. Thesis
Jack Lyle Walker 1974 171 p
Avail: Univ. Microfilms Order No. 75-10330

In a range-Doppler imaging system, the signal scattered from a moving object is resolved in terms of time-delay and Doppler frequency shift. A problem that arises in range-Doppler imaging known as 'motion through resolution cells' is considered. It is shown that this motion can be compensated by storing the appropriately demodulated return signal in a polar format and subsequently performing a two-dimensional Fourier transform. An analysis of the three-dimensional rotating object case with separate source and receiver locations is included. The effects of various system aberrations are investigated and experimental results from a microwave test range which demonstrate the image improvement obtained by using a polar storage format are presented. Dissert. Abstr.

N75-23543*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
A KALMAN FILTER FOR THE STOLAND SYSTEM
Stanley F. Schmidt Apr. 1975 67 p refs
(Contract NAS2-8503)
(NASA-CR-137668; Rept-75-10) Avail: NTIS HC $4.25 CSCL 17G

A simple Kalman filter for potential use in STOL navigation systems is described. The mathematical formulation of all the elements of the filter, its initialization and overall operation are presented. Simulation results show that a typical approach flight to landing, the Kalman filter has much smaller errors during navigation on TACAN data and during transition from TACAN to MODILS data than a complementary filter. Summary type flow charts of the Kalman filter logic designed for the Sperry 1819A computer are presented. Also, the memory and real time requirements of the Kalman filter and complementary filter are described. The Kalman filter is shown to gain its superior performance at the expense of real time and memory required in the onboard computer. Author

N75-23544*# United Air Lines, Inc., Denver, Colo.
IMPLICATIONS OF EQUIPPING A DC-8-61 FLEET WITH RNAV/TWO-SEGMENT APPROACH AVIONICS
Erik B. Anderson Feb. 1975 14 p refs
(Contract NAS2-7475)
(NASA-CR-137680) Avail: NTIS HC $3.25 CSCL 17G

Due to the costs of implementing two-segment approaches with special purpose computers, and the fact that such systems rely on special ground equipment not generally in use today, it is useful to consider the possibility of adding a two-segment approach capability to area navigation (RNAV) systems. The addition of the capability to provide two-segment approach navigation in an RNAV system which already interfaces with the standard instrument landing system is estimated to cost $1430 per aircraft. This includes the cost to add an approach progress display, to make necessary modifications to RNAV software, and to develop special approach plates. Author

N75-23545# Rome Air Development Center, Griffiss AFB, N.Y.
FAA LIGHTNING PROTECTION STUDY: LIGHTNING PROTECTION REQUIREMENTS FOR WILCOX MARK 1/A INSTRUMENT LANDING SYSTEM Final Report, 1 Feb. 1974 - 1 Jan. 1975
Richard H. Hu, Andrew W. Revay, Jr., and Richard M. Cosel Jan. 1975 62 p refs
(Contract DOT-FA72WAI-356)
(AD-A008934; FAA-RD-75-49) Avail: NTIS HC $4.25

The degree of susceptibility of the FAA Wilcox Mark 1/A electronic instrument landing system to electromagnetic pulse effects due to lightning, and devices and methods proposed to deal with the problem are examined. Lightning protection requirements, types of susceptible components and methods used to determine component withstand capability, and recommendations for specific protection devices and circuitry are covered. Appendices include a bibliography of sources and complete circuit diagrams of the affected subsystems. Author

N75-23546# National Weather Service, Sterling, Va. Test and Evaluation Div.
EVALUATION OF A DIGITAL DISPLAY SYSTEM (DDS) DRIVEN BY AN AUTOMATIC METEOROLOGICAL OBSERVING SYSTEM AMOS 3-70 Final Report, 15 Apr. - 30 Nov. 1974
Walter E. Hoehne Jan. 1975 30 p refs
(Contract FAA-ER-450-012A/B)
(AD-A008898; FAA-RD-75-17) Avail: NTIS HC $3.75

An evaluation of a digital display system driven by an automatic meteorological observing system (AMOS III-70) for a limited aviation weather reporting station was conducted. Data as displayed on the panel was compared with that transmitted directly by the AMOS-III 70. The data conversion and display panel were shown to be reliable and accurate. A means of detecting a faulty light-emitting diode was suggested. The need for the altimeter setting indicator of the AMOS III-70 to be coupled directly to the external atmosphere whenever the AMOS III-70 is in a force-ventilated room was discussed. Author

N75-23547# AEL Service Corp., Farmingdale, N.J.
ELECTROMAGNETIC INTERFERENCE SPECIFICATION LIMITS FOR AIR ROUTE TRAFFIC CONTROL CENTERS Final Report, Jun.-Oct. 1974
Margaretta V. Stone Mar. 1975 112 p refs Prepared for National Aviation Facilities Experimental Center, Atlantic City, N. J.
(Contract DOT-FA72NA-728)
(AD-A008926; FAA-NA-75-150; FAA-RD-75-29) Avail: NTIS HC $5.25

The test limits for measurement of electromagnetic interference (EMI) characteristics of electronic equipment, intended to be installed in Air Route Traffic Control Centers (ARTCC's) by the Federal Aviation Administration are specified. Limits and requirements for both emission and susceptibility are included. The limits are based on an analysis of radiated and conducted emission levels, found during EMI tests performed at three ARTCC's. Guidance for selection of specific limits for various ARTCC areas is given and suggested procedures for performing tests are outlined. Author

N75-23548# Mitre Corp., McLean, Va.
CONSOLIDATION OF U.S. OCEANIC AIR TRAFFIC CONTROL CENTERS IN PRE-AEROSAT ERA Final Report
Feisal S. Keblawi and John A. Scardina Mar. 1975 180 p refs
(Contract DOT-FA70WA-2448)
(AD-A009299; MTR-6880; FAA-EM-75-3) Avail: NTIS HC $7.00

The technical feasibility and cost benefits of consolidating and automating the Atlantic Oceanic Air Traffic Control (ATC) centers into one center and the Pacific Oceanic ATC centers into another center are studied. Emphasis is placed on the era prior to the introduction of oceanic satellite systems for communications and surveillance, and deriving traffic estimates, sizing the automation system for the estimated traffic, estimating controller staffing requirements, estimating requirements and availability of floor space for the operations room and computer equipment, and sizing the added communications requirements of the consolidated centers. Conculsions are presented. Author

N75-23549*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FOUR-DIMENSIONAL GUIDANCE ALGORITHMS FOR AIRCRAFT IN AN AIR TRAFFIC CONTROL ENVIRONMENT
Thomas Pecsvaradi Washington Mar. 1975 140 p refs

(NASA-TN-D-7829; A-5530) Avail: NTIS HC $5.75 CSCL 01B

Theoretical development and computer implementation of three guidance algorithms are presented. From a small set of input parameters the algorithms generate the ground track, altitude profile, and speed profile required to implement an experimental 4-D guidance system. Given a sequence of waypoints that define a nominal flight path, the first algorithm generates a realistic, flyable ground track consisting of a sequence of straight line segments and circular arcs. Each circular turn is constrained by the minimum turning radius of the aircraft. The ground track and the specified waypoint altitudes are used as inputs to the second algorithm which generates the altitude profile. The altitude profile consists of piecewise constant flight path angle segments, each segment lying within specified upper and lower bounds. The third algorithm generates a feasible speed profile subject to constraints on the rate of change in speed, permissible speed ranges, and effects of wind. Flight path parameters are then combined into a chronological sequence to form the 4-D guidance vectors. These vectors can be used to drive the autopilot/autothrottle of the aircraft so that a 4-D flight path could be tracked completely automatically; or these vectors may be used to drive the flight director and other cockpit displays, thereby enabling the pilot to track a 4-D flight path manually. Author

N75-23550# Federal Aviation Administration, Washington, D.C. Office of Systems Engineering Management.

ENGINEERING AND DEVELOPMENT PROGRAM PLAN; EN ROUTE CONTROL

Feb. 1975 92 p

(AD-A007623; FAA-ED-12-2A) Avail: NTIS HC $4.75 CSCL 17G

Implementation of the third generation en route ATC system, Model A3d2, provides basic automation capability for processing flight data and surveillance functions. Substantial upgrading of this basic capability is needed to meet the demand forecast for the en route system through the 1970's and into the 1980's. This document describes the development plan to build the features and functions necessary for upgrading the present third generation en route system. Program objectives, development activities, implementation considerations, and resource estimates are set forth. Author

N75-23551# Naval Postgraduate School, Monterey, Calif.

LINEARIZATION OF FM-CW RADAR SWEEP BY FEEDBACK M.S. Thesis

Steven Alfred Marshall Dec. 1974 88 p refs

(AD-A007867) Avail: NTIS CSCL 17/9

A frequency-modulated radar is a radar in which a continuous-wave transmission is frequency modulated in a known manner in order to obtain range information. When the frequency modulation is linear with time, the difference between the frequency of the received signal and the transmitted signal is directly proportional to the target range. The difference frequency is given by $(2R/c)(df/dt)$, R being the range to the target, c the velocity of electromagnetic waves and df/dt the slope of the sawtooth frequency modulation. Therefore, the difference frequency is proportional to both range and the slope of the modulated waveform. GRA

N75-23552# Army Missile Research, Development and Engineering Lab., Redstone Arsenal, Ala. Advanced Sensors Directorate.

ON THE STATISTICAL ANALYSIS OF THE RADAR SIGNATURE OF THE MQM-34D Interim Report

James W. Wright 31 Jan. 1975 26 p refs

(DA Proj. 1X3-64307-D-212)

(AD-A007765; RE-75-13; IR-2) Avail: NTIS CSCL 17/9

The report contains the results of an analysis of the radar signature of the MQM-34D target drone for aspect angles near normal to the roll axis for a vertically polarized measurements system. The radar cross section and glint are analyzed for monostatic and bistatic conditions and are compared with classical models. The glint is larger for near broadside aspects than for near nose-on aspects, as expected. The radar cross section does not roll off with increasing bistatic angle for these aspects as it does for near nose-on aspects. GRA

N75-23553# Facility Checking Squadron (1866th) (AFCS), Richards-Gebaur AFB, Mo.

RADAR STATION EVALUATION REPORT, PEASE AFB, NEW HAMPSHIRE TRACALS Evaluation Report

Robert L. Cranston 20 Dec. 1974 96 p

(AD-A007041; Rept-74/66-27) Avail: NTIS CSCL 17/7

The radar Traffic Control and Landing Systems (TRACALS) station evaluation report presents data collected, 15-25 Oct. 1974, to define the capabilities and limitations of the Radar Approach Control Facility located at Pease AFB, N.H. The facility is comprised of an AN/FPN-47 radar set, AN/FPN-16 radar set, AN/GPX-9B Air Traffic Control Radar Beacon System (ATCRBS), and associated power systems. Included in this report are descriptions of the fringes of the useable radar coverage line of Sight Diagrams ATCRBS coverage and tracking capabilities analysis of flight and performance data and performance predictions for these systems. The data presented in this report can be used as a guide for anticipated performance until there is an addition, deletion or relocation of equipment which would change the facility's capability or until a change occurs in the horizontal screening profile. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-23554 Purdue Univ., Lafayette, Ind.

COMPUTER-AUGMENTED DESIGN OF AIRCRAFT WING STRUCTURES Ph.D. Thesis

Pramote Tiewtranon 1974 144 p

Avail: Univ. Microfilms Order No. 75-10971

A design procedure for aircraft wing structure which consists of supplying a set parameters to describe the wing geometry and optimizing the weight of the structure is developed. A computer display terminal is used to monitor the progress of the design procedure. All computations are automated, and results are visually represented, by the display terminal in the form of graphs, figures, or numbers. Dissert. Abstr.

N75-23555*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

THE EFFECT OF CHINE TIRES ON NOSE GEAR WATER-SPRAY CHARACTERISTICS OF A TWIN ENGINE AIRPLANE

Thomas J. Yager, Sandy M. Stubbs, and John L. McCarty May 1975 26 p

(NASA-TM-X-72695) Avail: NTIS HC $3.75 CSCL 01C

An experimental investigation was performed to evaluate the effectiveness of nose gear chine tires in eliminating or minimizing the engine spray ingestion problem encountered on several occasions by the Merlin 4, a twin-engine propjet airplane. A study of the photographic and television coverage indicated that under similar test conditions the spray from the chine tires presented less of a potential engine spray ingestion problem than the conventional tires. Neither tire configuration appeared to pose any ingestion problem at aircraft speeds in excess of the hydroplaning speed for each tire, however, significant differences were noted in the spray patterns of the two sets of tires at sub-hydroplaning speeds. At sub-hydroplaning speeds, the conventional tires produced substantial spray above the wing which approached the general area of the engine air inlet at lower test speeds. The chine tires produced two distinct spray plumes at sub-hydroplaning speeds: one low-level plume which presented no apparent threat of ingestion, and one which at most test speeds was observed to be below the wing leading edge and thus displaced from the intakes on the engine nacelle. Author

N75-23556*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A STUDY OF HELICOPTER INTERIOR NOISE REDUCTION

James T. Howlett and Sherman A. Clevenson May 1975 8 p

refs Presented at the 31st Ann. Natl. Forum of the Amer. Helicopter Soc., May 1975
(NASA-TM-X-72655; L-10076) Avail: NTIS HC $3.25 CSCL 01C

The interior noise levels of existing helicopters are discussed along with an ongoing experimental program directed towards reducing these levels. Results of several noise and vibration measurements on Langley Research Center's Civil Helicopter Research Aircraft are presented, including measurements taken before and after installation of an acoustically-treated cabin. The predominant noise source in this helicopter is the first stage planetary gear-clash in the main gear box, both before and after installation of the acoustically treated cabin. Noise reductions of up to 20 db in some octave bands may be required in order to obtain interior noise levels comparable to commercial jet transports. Author

N75-23557*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CORRELATION OF LOW SPEED WIND TUNNEL AND FLIGHT TEST DATA FOR V/STOL AIRCRAFT
Woodrow L. Cook and David H. Hickey Apr. 1975 13 p refs
(NASA-TM-X-62423; A-5998) Avail: NTIS HC $3.25 CSCL 01C

The XV-5B fan-in-wing aircraft and the YOV-10 RCF rotating cylinder flap aircraft were subjected to wind tunnel tests. These tests were conducted specifically to provide for correlation between wind tunnel and inflight aerodynamics and noise test data. Correlation between aerodynamic and noise data are presented and testing techniques that are related to the accuracy of the data, or that might affect the correlations, are discussed. Author

N75-23558*# Rockwell International Corp., Los Angeles, Calif.
DESIGN AND ANALYSIS OF A SUPERSONIC PENETRATION/MANEUVERING FIGHTER
R. D. Child Apr. 1975 182 p refs
(Contract NAS1-13496)
(NASA-CR-132633) Avail: NTIS HC $7.00 CSCL 01B

The design of three candidate air combat fighters which would cruise effectively at freestream Mach numbers of 1.6, 2.0, and 2.5 while maintaining good transonic maneuvering capability, is considered. These fighters were designed to deliver aerodynamically controlled dogfight missiles at the design Mach numbers. Studies performed by Rockwell International in May 1974 and guidance from NASA determined the shape and size of these missiles. The principle objective of this study is the aerodynamic design of the vehicles; however, configurations are sized to have realistic structures, mass properties, and propulsion systems. The results of this study show that air combat fighters in the 15,000 to 23,000 pound class would cruise supersonically on dry power and still maintain good transonic maneuvering performance. Author

N75-23559*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF CANARD POSITION AND WING LEADING-EDGE FLAP DEFLECTION ON WING BUFFET AT TRANSONIC SPEEDS
Blair B. Gloss, William P. Henderson, and Jarrett K. Huffman 16 Apr. 1974 92 p refs
(NASA-TM-X-72681) Avail: NTIS HC $4.75 CSCL 01C

A generalized wind-tunnel model, with canard and wing planform typical of highly maneuverable aircraft, was tested. The addition of a canard above the wing chord plane, for the configuration with leading-edge flaps undeflected, produced substantially higher total configuration lift coefficients before buffet onset than the configuration with the canard off and leading-edge flaps undeflected. The wing buffet intensity was substantially lower for the canard-wing configuration than the wing-alone configuration. The low-canard configuration generally displayed the poorest buffet characteristics. Deflecting the wing leading-edge flaps substantially improved the wing buffet characteristics for canard-off configurations. The addition of the high canard did not appear to substantially improve the wing buffet characteristics of the wing with leading-edge flaps deflected. Author

N75-23560# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THE REINFORCED THIN-WALLED CONSTRUCTION BY THE METHOD OF THE FINAL ELEMENT
Yu. I. Ivanov 14 Feb. 1975 36 p refs Transl. into ENGLISH from Tsent. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 3, no. 1, 1972 p 51-60
(AD-A007307; FTD-MT-24-0427-75) Avail: NTIS CSCL 01/3

The finite element method is utilized to study various reinforced thin-walled aircraft structures. Examples of calculations are given of a series of constructions to illustrate the possibilities of the method. J.M.S.

N75-23561# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME PROBLEMS OF MODELLING AEROELASTIC PHENOMENA IN A TRANSONIC TUNNEL
J. Malecek and J. Vrhel 22 Jan. 1974 26 p refs Transl. into ENGLISH from Zpravodaj Vzlu (Czechoslovakia), no. 4(100), 1973 p 7-15
(AD-A007391; FTD-HC-23-0721-75) Avail: NTIS CSCL 01/3

The parameters of training jets are usually at the lower limit of the transonic region. The aeroelastic phenomena which are observed are considerably influenced by air compressibility. The theoretical solution of these phenomena does not yield satisfactory results, and there is a need for the use of model systems. This contribution analyzes the capabilities of aeroelastic modelling by a transonic model. GRA

N75-23562# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
ADVANCED OVERRUNNING CLUTCH TECHNOLOGY, DESIGN PHASE Technical Report, Mar. - Oct. 1974
Jules Kish 1974 97 p refs
(Contract DAAJ02-74-C-0028)
(AD-A007815) Avail: NTIS CSCL 13/9

This report discusses the results of the definition of requirements and design phases of the Advanced Overrunning Clutch Technology program conducted by Sikorsky Aircraft for the Eustis Directorate. The purpose of this program is to develop helicopter overrunning clutches for use at engine speeds. Current practice is to design the free-wheel unit to operate at the second stage of gearing with speeds from 6,000 to 8,000 rpm. At the engine speed, torque is lower and hence the free-wheel unit will be lighter. GRA

N75-23563# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
PARAMETRIC ANALYSIS OF AN ADVANCED MANNED INTERCEPTOR UTILIZATION Final Report, Mar.-Nov. 1973
Norman A. Hirsch Jan. 1975 101 p refs
(AD-A007663; AFAPL-TR-74-42) Avail: NTIS CSCL 15/3

This report parametrically reviews the interceptor and patrol aircraft requirements to adequately defend the CONUS against penetrating aircraft with a stand off missile; and subsequently reviews the interceptor and patrol aircraft requirements to assure patrol aircraft survivability against the same penetrating aircraft with an air-to-air missile. In the first situation, the only consideration is CONUS defense without regard for patrol aircraft survivability, while the latter considered both CONUS defense and patrol aircraft survivability. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-23564# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioural Sciences Div.
CF5D AIRCRAFT COCKPIT-NOISE REDUCTION
S. E. Forshaw and S. W. Olsen Sep. 1974 39 p refs
(DCIEM-74-R-1048) Avail: NTIS HC $3.75

A sound survey was conducted in a modified CF5D aircraft to determine the effectiveness of prototype floor and torso-valve mufflers in reducing the noise produced by the cockpit air conditioner. The noise levels in the rear cockpit of a modified aircraft were about 6, 10 and 12 dBA less, for air-conditioner settings 'full cold', '60 F', and 'full hot respectively, than in an unmodified aircraft flown under identical conditions. Author

N75-23565# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
THE STATE OF THE ART IN OIL QUALITY GAGING ON US MILITARY AND COMMERCIAL AIRCRAFT
John W. Long Sep. 1974 45 p refs
(AD-A007682; ASD-TR-74-39) Avail: NTIS CSCL 01/3

This report reviews the principal design techniques used in oil quantity gaging systems for U.S. military and commercial aircraft. The most pertinent design details of four oil quantity gaging systems are discussed and the author's opinion as to the merits of certain characteristics of each design is given based upon the potential of the basic design while operating in military environments. An attempt is made to rate each of the four designs in the following areas: adequacy of performance, vulnerability to military aircraft environments, simplicity of design and reproducibility, and maintainability. GRA

N75-23566# Hughes Aircraft Co., Culver City, Calif. Display Systems and Human Factors Dept.
ADVANCED TECHNICAL EVALUATION OF A MASTER MONITOR DISPLAY Final Report, 19 Oct. 1973 - 19 Oct. 1974
R. W. Lowe, R. J. Vanderkolk, G. Wolfson, and L. L. Young Oct. 1974 101 p refs
(Contract N62269-74-C-0149)
(AD-A007699; HAC-P74-457) Avail: NTIS CSCL 01/4

The report encompasses efforts directed toward the evaluation and validation of the Master Monitor concept developed during conduct of a previous program. Specifically, a series of laboratory studies were conducted which encompass the following: (1) mechanization and evaluation of candidate flat panel display devices for use as the Master Monitor display media, (2) display alerting techniques for alerting the pilot to a system failure, and (3) validation of the MMD information processing system concept. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N75-23567*# Texas A&M Univ., College Station. Texas Engineering Experiment Station.
IMPROVEMENT OF PROPELLER STATIC THRUST ESTIMATION Final Report
J. Brusse and C. F. Kettleborough May 1975 28 p refs
(Grant NGR-44-001-011)
(NASA-CR-132680) Avail: NTIS HC $3.75 CSCL 03C

The problem of improving the performance estimation of propellers operating in the heavily loaded static thrust condition was studied. The Goldstein theory was assessed as it applies to propellers operating in the static thrust. A review of theoretical considerations is presented along with a summary of the attempts made to obtain a numerical solution. The chordwise pressure distribution was determined during operation at a tip speed of 500 ft/sec. Chordwise integration of the pressures leads to the spanwise load distribution and further integration would give the axial thrust. Author

N75-23568*# Lockheed-California Co., Burbank.
CONCEPTUAL DESIGN STUDY OF ADVANCED ACOUSTIC COMPOSITE NACELLE Final Report, Jun. 1974 - Feb. 1975
R. G. Goodall and G. W. Painter May 1975 241 p refs
(Contract NAS1-13233)
(NASA-CR-132649; LR-27113) Avail: NTIS HC $7.50 CSCL 21A

Conceptual nacelle designs for wide-bodied and for advanced-technology transports were studied with the objective of achieving significant reductions in community noise with minimum penalties in airplane weight, cost, and in operating expense by the application of advanced composite materials to nacelle structure and sound suppression elements. Nacelle concepts using advanced liners, annular splitters, radial splitters, translating centerbody inlets, and mixed-flow nozzles were evaluated and a preferred concept selected. A preliminary design study of the selected concept, a mixed flow nacelle with extended inlet and no splitters, was conducted and the effects on noise, direct operating cost, and return on investment determined. Author

N75-23569*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FULL SCALE UPPER SURFACE BLOWN FLAP NOISE
L. J. Heidelberg, L. Homyak, and W. L. Jones 1975 28 p refs Presented at the Natl. Air Transportation Meeting, Hartford, Conn., 6-8 May 1975; sponsored by the Soc. of Automotive Engr.
(NASA-TM-X-71708; E-8322) Avail: NTIS HC $3.75 CSCL 20A

A highly noise suppressed TF 34 engine was used to investigate the noise of several powered lift configurations involving upper surface blown (USB) flaps. The configuration variables were nozzle type (i.e. slot and circular with deflector), flap chord length, and flap angle. The results of velocity surveys at both the nozzle exit and the flap trailing edge are also presented and used for correlation of the noise data. Configurations using a long flap design were 4 db quieter than a short flap typical of current trends in USB flap design. The lower noise for the long flap is attributed primarily to the greater velocity decay of the jet at the flap trailing edge. The full-scale data revealed substantially more quadrupole noise in the region near the deflected jet than observed in previous sub-scale tests. Author

N75-23570*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA REFAN PROGRAM STATUS
K. L. Abdalla and J. A. Yuska 1975 35 p refs Presented at the Air Transportation Meeting, Hartford, Conn., 6-8 May 1975; sponsored by Soc. of Automotive Eng.
(NASA-TM-X-71705) Avail: NTIS HC $3.75 CSCL 21E

The objective of the refan program is to demonstrate the technical feasibility of substantially reducing the noise levels of existing JT8D powered aircraft. The program consists of the design, manufacturing and testing of the refan engines and modified nacelles and airplanes. Experimental testing was completed for the refan engine both at sea level and at altitude conditions. Ground testing for the B727 side- and center-engine installations and flight testing of the DC-9 with refan engines and acoustic nacelles were performed. Preliminary results presented show that substantial noise reductions were achieved. Author

N75-23571*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A STUDY OF REACTING FREE AND DUCTED HYDROGEN/AIR JETS
H. Lee Beach, Jr. May 1975 46 p refs
(NASA-TM-X-72678) Avail: NTIS HC $3.75 CSCL 20D

The mixing and reaction of a supersonic jet of hydrogen in coaxial free and ducted high temperature test gases were investigated. The importance of chemical kinetics on computed results, and the utilization of free-jet theoretical approaches to compute enclosed flow fields were studied. Measured pitot pressure profiles were correlated by use of a parabolic mixing analysis employing an eddy viscosity model. All computations, including free, ducted, reacting, and nonreacting cases, use the same value of the empirical constant in the viscosity model. Equilibrium and finite reate chemistry models were utilized. The finite rate assumption allowed prediction of observed ignition delay, but the equilibrium model gave the best correlations

downstream from the ignition location. Ducted calculations were made with finite rate chemistry; correlations were, in general, as good as the free-jet results until problems with the boundary conditions were encountered. Author

N75-23572*# Aerojet Liquid Rocket Co., Sacramento, Calif.
MULTIPLE JET STUDY DATA CORRELATIONS Final Report
R. E. Walker and R. G. Eberhardt Apr. 1975 74 p refs
(Contract NAS3-18026)
(NASA-CR-134795) Avail: NTIS HC $4.25 CSCL 20D

Correlations are presented which allow determination of penetration and mixing of multiple cold air jets injected normal to a ducted subsonic heated primary air stream. Correlations were obtained over jet-to-primary stream momentum flux ratios of 6 to 60 for locations from 1 to 30 jet diameters downstream of the injection plane. The range of geometric and operating variables makes the correlations relevant to gas turbine combustors. Correlations were obtained for the mixing efficiency between jets and primary stream using an energy exchange parameter. Also jet centerplane velocity and temperature trajectories were correlated and centerplane dimensionless temperature distributions defined. An assumption of a Gaussian vertical temperature distribution at all stations is shown to result in a reasonable temperature field model. Data are presented which allow comparison of predicted and measured values over the range of conditions specified above. Author

N75-23573*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN APPLICATION OF MODERN CONTROL THEORY TO JET PROPULSION SYSTEMS
Walter C. Merrill May 1975 154 p refs
(Grant NGR-36-010-024)
(NASA-TM-X-71726) Avail: NTIS HC $6.25 CSCL 01D

The control of an airbreathing turbojet engine by an onboard digital computer is studied. The approach taken is to model the turbojet engine as a linear, multivariable system whose parameters vary with engine operating environment. From this model adaptive closed-loop or feedback control laws are designed and applied to the acceleration of the turbojet engine. Author

N75-23574# National Gas Turbine Establishment, Pyestock (England).
THRUST/DRAG ANALYSIS FOR A FRONT FAN NACELLE HAVING TWO SEPARATE CO-AXIAL EXHAUST STREAMS
P. G. Street 1975 38 p refs Supersedes NGTE-321; ARC-34645
(ARC-CP-1311; NGTE-321; ARC-34645) Avail: NTIS HC $3.75; HMSO 90p; PHI $4.10

The forces acting on and around a high by-pass ratio front fan nacelle are considered in terms of the findings of an ARC panel on thrust and drag definitions for jet engines. Thrust and drag components which take account of mutual interference are defined. A technique for defining an afterbody, or gas generator cowl drag in the presence of external flow is derived and the experimental measurements required are listed. Example calculations using experimental data are used to demonstrate the technique. Author

N75-23575# Advisory Group for Aerospace Research and Development, Paris (France).
POWER PLANT CONTROLS FOR AERO-GAS TURBINE ENGINES
Mar. 1975 374 p refs In ENGLISH; partly in FRENCH Presented at the 44th Meeting of the AGARD Propulsion and Energetics Panel, Ustaoset, Norway, 9-13 Sep. 1974
(AGARD-CP-151) Avail: NTIS HC $10.00

Control requirements, control simulation techniques, and control system hardware for improved reliability of aircraft gas turbine engines are elaborated. For individual titles, see N75-23576 through N75-23601.

N75-23576 National Research Council of Canada, Ottawa (Ontario).
AEROTHERMODYNAMIC FACTORS GOVERNING THE RESPONSE RATE OF GAS TURBINES
B. D. MacIsaac and H. I. H. Saravanamuttoo (Carleton Univ.) *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 11 p refs (For availability see N75-23575 15-07)

The constraints on gas turbine response rates resulting from aerothermodynamic considerations are reviewed and the use of variable geometry to improve the response rate is discussed. Mathematical models, which have to be verified experimentally, permit a detailed investigation of engine transient response. The transient behavior of a single spool unit is quite different from that of a twin spool unit and techniques of improving the response rate of both are discussed; significant gains can be realized and the use of simulation techniques permits these to be evaluated before carrying out actual engine tests. Author

N75-23577 Centre d'Essais de Propulseurs, Saclay (France).
CONTRIBUTION OF FLIGHT SIMULATION TESTS TO THE STUDY OF TURBOMACHINE CONTROL [CONTRIBUTION DES ESSAIS EN VOL SIMULE A L'ETUDE DE LA REGULATION DES TURBOMACHINES]
Vincent Nardone and Jean Claude Ripoll *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 9 p refs In FRENCH (For availability see N75-23575 15-07)

Flight simulation tests and their use to develop controls for turbine engines under various flight conditions are discussed. Tests examined the effects of pressure, static pressure build up, and temperature at various Mach numbers. Engine response and control during the transition phase were also studied.
Transl. by E.H.W.

N75-23578 Boeing Commercial Airplane Co., Renton, Wash. Propulsion Technology Controls Group.
AN AIRFRAME MANUFACTURER'S REQUIREMENTS FOR FUTURE PROPULSION CONTROLS
Peter W. Kamber *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 17 p refs (For availability see N75-23575 15-07)

Selective allocation of service bleed is presented as a means of extending engine life for a mix of nominal and deteriorating engines while preserving a desired thrust distribution. Rating command control is examined as a means to permit simple and definitive power setting, where each power rating is uniquely associated with a pushbutton or throttle position. Hydromechanical and electronic control systems are compared and it is reported that electronics will be used for most advanced control modes. Electronic engine controls are also presented as the foundation for improved coordination with flight controls, and for on-line engine condition monitors. Author

N75-23579 Rolls-Royce, Ltd., Derby (England).
CONTROL SYSTEM REQUIREMENTS DICTATED BY OPTIMIZATION OF ENGINE OPERATION
Christopher Linley Johnson *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 5 p (For availability see N75-23575 15-07)

A pneumatic mechanical flat rating system is included in the RB 211 control system and the reason for the choice of parameters on which this operates is discussed. On this system the pilot sets up the engine rating and the control then maintains it through variations of temperature and altitude. Author

N75-23580 Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn. Electronic Systems Dept.
ENGINE CONTROL FOR HARPOON MISSILE SYSTEM
D. A. Prue *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 14 p (For availability see N75-23575 15-07)

The fuel control system for the Teledyne CAE J402-CA-400 engine is described. The control is configured as a low cost, engine mounted, closed loop electronic system. It measures exhaust gas temperature and compressor inlet temperature as sensed parameters for acceleration. A unique and straightforward approach to hydraulic system implementation utilizes a direct engine driven centrifugal pump and a proportional solenoid fuel metering system. The pump and fuel metering components constitute one assembly installed in the engine tail cone. The control approach and the reasons for selection of the mode of control and hardware implementation are described. The engine is used as the sustainer propulsion system for the U. S. Navy harpoon missile system. Author

N75-23581 Ministry of Defence, London (England).
RELIABILITY SPECIFICATION FOR GAS TURBINE CONTROL SYSTEMS
C. G. White *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 9 p refs (For availability see N75-23575 15-07)

Reliability is a procurement requirement like any other parameter such as cost, response or program time scale. The problems peculiar to engine control systems are examined and some suggestions made. The problems of specifying reliability parameters are reviewed and methods of reliability assurance and measurement are described. Author

N75-23582 Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
THE ROLE OF COMPUTERS IN FUTURE PROPULSION CONTROLS
Charles E. Bentz *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 9 p refs (For availability see N75-23575 15-07)

The role of computers in future propulsion controls is reviewed from two different viewpoints - the integrated avionics approach and the dedicated propulsion system approach. The discussion presented suggests that a dedicated computer for the propulsion system control will provide a more optimum solution in the future in terms of cost, complexity, and reliability. An integrated avionic systems approach that also includes the propulsion system control poses many new problems in the areas of system management and hardware development that may overshadow any of the immediate benefits of using a central processor. Author

N75-23583 Pratt and Whitney Aircraft, East Hartford, Conn.
CONTROL DESIGN CONSIDERATIONS FOR VARIABLE GEOMETRY ENGINES
W. K. Tervo and J. M. Tringali *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 8 p refs (For availability see N75-23575 15-07)

Variable cycle engine control requirements are described. Control variables and potential sensed parameters are discussed. The complexity of the job is shown to require optimal control logic. An application of optimal control techniques is presented including simulation results. Author

N75-23584 Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
PRAC: A NEW AERO GAS TURBINE ENGINE CONTROL CONCEPT
K. Bauerfeind *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 14 p (For availability see N75-23575 15-07)

The Pressure Ratio Acceleration Control (PRAC) offers a new approach to the control of modern aero gas turbine engines. With the exception of the use of high accuracy pressure transducers mounted in a temperature controlled box directly on the engine all other system components are of today's standard of technology. A simple bread board model of PRAC had been built and successfully tested in conjunction with an Orpheus jet engine in a high altitude test facility. A more sophisticated PRAC control system for a modern supersonic bypass engine is being tested at present in conjunction with an engine simulator and the actual fuel system hardware on a control system rig at MTU. The paper outlines the control philosophy of PRAC and presents test results achieved so far. Author

N75-23585 Rolls-Royce, Ltd., Watford (England). Small Engine Div.
HELICOPTER ENGINE CONTROL: THE PAST 20 YEARS AND THE NEXT
Edward A. Simonis and Malcolm P. Perks *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 16 p (For availability see N75-23575 15-07)

The first 20 years of gas turbine application to helicopters and the progressive evolution of their associated fully automatic engine control systems are surveyed. It is only recently that the dominant performance and safety requirements of the control have emerged with sufficient clarity to allow them to be viewed by an overall systems engineering approach instead of as piecemeal needs. A system is outlined which offers substantial reductions in size and weight over current systems without any sacrifice in performance or safety and with marked improvement in integrity. The utilization of digital control techniques leads to simple handling from the cockpit with self monitoring facilities and unambiguous reversionary control modes. Such a system is seen as setting a pattern for control of helicopter engines of the future. Author

N75-23586 National Gas Turbine Establishment, Farnborough (England).
A DIGITAL CONTROLLER APPLIED TO THE LIMITATION OF REHEAT COMBUSTION ROUGHNESS
J. H. Waters *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 8 p ref (For availability see N75-23575 15-07)

Reheat combustion roughness or buzz could cause damaging fluctuations in jet pipe pressure in high performance reheat combustion systems. A control scheme is described which controls reheat fuel flow so as to limit the level of jet pipe pressure fluctuations to safe values. Factors which affect the design and implementation of the controller are discussed and an indication given of its performance. Author

N75-23587 Dowty Fuel Systems, Ltd., Cheltenham (England).
AFTERBURNING REGULATION CONCEPTS
K. Robinson *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 17 p (For availability see N75-23575 15-07)

Various concepts of afterburner flow regulation are examined with particular reference to bypass type engines requiring rapid thrust modulation with minimum disturbance to engine operating conditions. Logic and sequencing functions associated with selection of afterburner operation are examined. Afterburner system organization is discussed briefly and the merits and short comings of alternative concepts are argued. Author

N75-23588 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Villaroche (France).
EVOLUTION OF TURBOREACTOR CONTROL SYSTEMS [EVOLUTION DES SYSTEMES DE REGULATION DES TURBOREACTEURS]
Andre Barbot *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 8 p In FRENCH (For availability see N75-23575 15-07)

Techniques used to develop control systems for turboreactors and the problems, advantages, and disadvantages of each method are discussed. Special attention was given to electronic and numerical techniques. The performance of the turboreactor using each technique was examined. Transl. by E.H.W.

N75-23589 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
AN AIR INTAKE CONTROL SYSTEM FOR A SUPERSONIC FIGHTER AIRCRAFT
J. Peikert *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 5 p (For availability see N75-23575 15-07)

A description of an air intake system of the two dimensional external compression type and its associated air intake control system is given. The AICS comprises a wedge control only. Intake operating maps, derived from small scale wind tunnel test results, are shown and the resulting selection of control signals and the control concept is presented. The performance of the intake and the AICS is substantiated by full scale wind tunnel test results. Finally the hardware implementation of the AICS from a system standpoint is also given. Author

N75-23590 Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France).
NUMERICAL CONTROL OF A TURBOMACHINE [REGULATION NUMERIQUE D'UNE TURBOMACHINE]
Michel Brunet, Jean Claude Laprie, and Christian Beth (Innovations et Developpements en Aerothermodynamique, Toulouse, Fr.) *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 15 p refs In FRENCH (For availability see N75-23575 15-07)

Definition, concepts, realization, and tests of a numerical control system for a turbomachine with free turbines and low

power are given. The real time numerical control concept has two functions: one to obtain a performance gain in the turbomachine and two, to increase functional reliability. An examination was also made of problems posed by such a system. In particular, problems of defining the command control and determining necessary variables for a working system, modernization and identification of turbomachines, and testing the control system on a turbomachine under flight conditions to measure and verify principle results were examined. Transl. by E.H.W.

N75-23591 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Melun (France).
SIMULATION TECHNIQUES FOR TURBOMACHINES [TECHNIQUES DE SIMULATION DES TURBOMACHINES]
Andre Barbot *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 8 p In FRENCH (For availability see N75-23575 15-07)

General problems posed by the simulation of a turbomachine are introduced. Data cover: (1) simple and complex mathematical models, (2) rapid analysis of current simulation techniques, and (3) assessment of typical turbomachine control problems and the proposal of different solutions to the problems. Special attention was given to the problem of adapting the control function to flight conditions. E.H.W.

N75-23592 National Research Council of Canada, Ottawa (Ontario). Engine Lab.
EQUILIBRIUM PERFORMANCE ANALYSIS OF GAS TURBINE ENGINES USING INFLUENCE COEFFICIENT TECHNIQUES
E. P. Cockshutt *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 10 p refs (For availability see N75-23575 15-07)

Starting from a specified engine design point, a computer oriented technique is described for establishing the equilibrium off-design performance. The technique involves the control system approach of linearizing the governing equations at the design point, in order to establish a matrix of engine response influence coefficients. These coefficients are then used to achieve rapid convergence as the cycle iterates to an off-design operating point. For clarity of presentation, the technique is developed for the simple turbojet cycle, but the extrapolation to turbofan cycles is indicated. By way of illustrative example of the equilibrium analysis technique, attention is given to the temporary extraction of large amounts of air bleed from a turbofan, for applications such as flap blowing and reaction controls. Engine response to this perturbation is assessed, and control implications suggested. Author

N75-23593* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GENERALIZED DYNAMIC ENGINE SIMULATION TECHNIQUES FOR THE DIGITAL COMPUTERS
James Sellers and Fred Teren *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 23 p refs (For availability see N75-23575 15-07)

Recently advanced simulation techniques have been developed for the digital computer and used as the basis for development of a generalized dynamic engine simulation computer program, called DYNGEN. This computer program can analyze the steady state and dynamic performance of many kinds of aircraft gas turbine engines. Without changes to the basic program, DYNGEN can analyze one- or two-spool turbofan engines. The user must supply appropriate component performance maps and design point information. Examples are presented to illustrate the capabilities of DYNGEN in the steady state and dynamic modes of operation. The analytical techniques used in DYNGEN are briefly discussed, and its accuracy is compared with a comparable simulation using the hybrid computer. The impact of DYNGEN and similar digital programs on future engine simulation philosophy is also discussed. Author

N75-23594 National Gas Turbine Establishment, Farnborough (England).
TOTAL POWERPLANT SIMULATION
R. V. Cottington *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 24 p refs (For availability see N75-23575 15-07)

The capability of predicting the steady state performance of a gas turbine engine is extended to include the prediction of its transient behavior as well. The development and implementation of a total powerplant simulation, consisting of intake and engine, that is capable of predicting both steady state and transient performance are described. The simulation is based on the synthesis of the thermodynamic relationships describing each powerplant component. During the development stage, digital simulation techniques are used, although the simulation is finally implemented on a hybrid computer in order to achieve real time operation. Actual steady state and transient test bed results are then used, when available, to validate the simulation. Author

N75-23595 Lucas Aerospace Ltd., Birmingham (England).
USE OF SIMULATION IN THE DESIGN, DEVELOPMENT AND TESTING OF POWER PLANT CONTROL SYSTEMS
Stephan Nye and Robert J. Vickers *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 13 p (For availability see N75-23575 15-07)

The design, development and testing of an engine control system are discussed. Two specific areas are highlighted: (1) Digital simulation using large scale computers where both engine and control system are represented by mathematical models for evaluation, feasibility and tolerance analysis; and (2) hybrid computers, where a real time digital engine simulation is used in conjunction with a speed controlled rig for real time development of the control hardware. Author

N75-23596 Lucas Aerospace Ltd., Birmingham (England).
THE USE OF DIGITAL CONTROL FOR COMPLEX POWER PLANT MANAGEMENT
D. M. Griffiths and R. D. Powell *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 26 p refs (For availability see N75-23575 15-07)

The application of digital control techniques to complex power plants is considered by describing the general structure of a digital controller in regard to system requirements. A description is then provided of an engineered controller. The characteristics of the unit are given together with details of its construction, software, reliability and integrity targets. From this experience reasonable conclusions can be drawn with respect to its area of application and of the likely future for digital techniques. Author

N75-23597 International Harvester Co., San Diego, Calif. Solar Div.
TEMPERATURE MEASUREMENT FOR ADVANCED GAS TURBINE CONTROLS
David A. Rohy, T. E. Duffy, and W. A. Compton *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 27 p refs (For availability see N75-23575 15-07)

Modern gas turbine engines with turbine inlet temperatures higher than metal melting temperatures must have control systems which provide subsecond response to changes in gas or metal temperatures. High quality data are required to provide for the most efficient engine operation consistent with engine safety. Recently developed instruments measure individual blade temperature, and another non-immersion gas temperature sensor, not yet fully developed, will provide accurate gas temperature data up to 1927 C. These instruments are described with present and potential uses in control systems. Author

N75-23598 Pisa Univ. (Italy).
FLUIDIC SENSORS FOR TURBOJET ENGINES
D. Dini and M. Santochi *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 28 p refs (For availability see N75-23575 15-07)

Fluidics may replace electronics in modern advanced turbojet engine instrumentation technology for comprehensive engine condition monitoring in highly unfavourable environments. This paper discusses some fluidic sensors originally tested in our laboratory: (1) new types of rotational speed sensors utilizing air flows output being a pressure signal proportional to the value to be measured, suitable for analog and digital circuits; and (2) gas stream temperature sensors, using a thermometric bulb, or a bimetallic spring, or a capillary tube, or a turbulent jet. Corresponding experimental results are summarized and com-

pletely fluidic circuits for a small gas turbine and for fire detection in a turbojet engine are described. Author

N75-23599 Pierburg Luftfahrtgeraete Union G.m.b.H., Neuss (West Germany).
A NEW LIGHTWEIGHT FUEL CONTROL SYSTEM FOR ELECTRICAL INPUTS
Heinz Holzem *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 30 p refs (For availability see N75-23575 15-07)

Most modern control concepts for complex aero gas turbine engines employ more and more electronic hardware for the function generating part. It was therefore necessary to define the requirements for a simple lightweight fuel metering system, basically consisting of a pumping device, manifolds, filters and an electrically controlled metering value controlled by the electronic box. Such a system has been specified and is being built and developed at present. This fuel system will be used in conjunction with the PRAC electronic control. The paper describes this system and highlights critical design and development areas. Author

N75-23600 Dowty Fuel Systems, Ltd., Cheltenham (England).
PUMPING SYSTEM DESIGN RELATED TO FUEL SYSTEM SPECIFICATIONS
A. T. Miles *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 32 p (For availability see N75-23575 15-07)

Design of the pump in its context, the fuel system, is discussed. System requirements are related to pump limitations: So varied are the requirements that the pumps have to be specifically designed for the system. Discussion first centers on optimizing low pressure systems to minimize heat rejection to the fuel. The concepts of net positive suction head and vapor liquid ratio are contrasted in the context of cavitation. Description of two phase flow regimes leads to particular focus on the engine driven backing pump. Design philosophy to cope with contaminated fuel is followed by an analysis of turn down heat to fuel problems as they affect the high pressure dry engine pump and the afterburner pump. The large afterburner turn down flow ratio justifies the vapor core pump design and its principle of operation is outlined. Author

N75-23601 Colt Industries, Inc., West Hartford, Conn.
ADVANCED ENGINE MOUNTED FUEL PUMP TECHNOLOGY
John E. Cygnor *In* AGARD Power Plant Controls for Aero-Gas Turbine Eng. Mar. 1975 33 p (For availability see N75-23575 15-07)

Based upon the flight envelope of a typical high performance aircraft, the relationship between the efficiency of engine mounted fuel pumps at high fuel flow turndown ratios and the fuel heat sink available to the engine and airframe is discussed. The effect of the pump efficiency on the fuel heat sink is presented in terms of the temperature rise imparted to the fuel by the pump and fuel flow metering system. The sources of losses of conventional fuel pump and metering systems which contribute to the fuel temperature rise are identified and pump and metering systems which will reduce those losses are discussed. Examples of pump types which are applicable to advanced turbine engines are presented in terms of performance parameters and system advantages. Author

N75-23602*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSONIC OFF-DESIGN DRAG AND PERFORMANCE OF THREE MIXED-COMPRESSION AXISYMMETRIC INLETS
Richard R. Woollett, Edward T. Meleason, and David A. Choby Washington Jun. 1975 50 p refs
(NASA-TM-X-3215; E-8146) Avail: NTIS HC $3.75 CSCL 21A

An experimental investigation was conducted to determine the off-design drag and pressure performance of three axisymmetric supersonic inlets in the transonic speed range. For typical engine airflows at Mach 0.8 the drag coefficient varied from 0.045 to 0.09; at Mach 1.2 the largest drag coefficient measured was 0.25. Below Mach 0.9 a lower drag resulted when all or at least part of the excess weight flow was spilled over the cowl rather than through the bypass doors; above Mach 1.1 the lowest drag was obtained by bypassing excess flow. Author

N75-23603# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
HIGH TEMPERATURE TESTS OF A JP-5 TYPE FUEL Final Report, 20 Sep. - 15 Nov. 1972
Warren Bucher and Royce Bradley Jan. 1975 31 p refs
(AF Proj. 3048)
(AD-A007662; AFAPL-TR-74-74) Avail: NTIS CSCL 21/4

Tests were performed to determine the thermal stability of a JP-5 jet fuel with varying concentrations of dissolved oxygen under supercritical pressure and temperature conditions. Tests were done with the Advanced Aircraft Fuel Systems Simulator using a simulated engine manifold. Small unintentional variations in the test pressure caused large changes in deposit formation rate. These variations obscured any effects of dissolved oxygen. The results indicate that tests to determine the effects of dissolved oxygen on thermal stability of jet fuel at supercritical conditions will have to be run with carefully controlled test pressures. GRA

N75-23604# Exxon Research and Engineering Co., Linden, N.J. Government Research Lab.
DEVELOPMENT OF HIGH STABILITY FUEL Final Report, 1 Jul. - 31 Dec. 1974
William F. Taylor and John W. Grankenfeld Jan. 1975 123 p refs
(Contract N00140-74-C-0618)
(AD-A007574; GRU.13.GAHF.75) Avail: NTIS CSCL 21/4

The study of oxygenated trace impurities on the stability of Humble JP-5 was extended to include a typical aliphatic-aromatic ester, (methyl benzoate) an aliphatic ester (phenyl formate) an aliphatic alcohol (n-dodecyl alcohol) and a ketone (5-nonanone). All were evaluated in deoxygenated Humble JP-5 at the 100 PPM 0 level. Hexanoic, was also investigated. Six new diolefins were evaluated in a deoxygenated synthetic 4-component blend. This blend consisted of 25% (by weight) of n-dodecane, 25% of 2,2,5-trimethylhexane, 30% of isopropylcyclohexane and 20% of secbutylbenzene. The results confirm the previous observations that structural features play an important part in determining the influence of olefins on deposit formation. A representative substituted acetylene, 1-decyne, was also tested in the 4-component synthetic blend. Two condensed ring hydrocarbons, indan and tetralin, were tested in a new 4-component blend. Scanning electron microscope studies of deposit morphology were extended to pure hydrocarbon blends containing various amounts of dissolved oxygen. A survey of the use of acid washing, caustic washing and absorbents in refining of jet fuel was conducted to determine the possible changes in trace impurity content brought about by such processing steps. GRA

N75-23605# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
PRACTICAL STABILITY OF A RELUCTANCE SYNCHRONOUS MACHINE Final Report, Oct. 1973 - Mar. 1974
William U. Borger Feb. 1975 81 p refs
(AF Proj. 3145)
(AD-A007659; AFAPL-TR-74-118) Avail: NTIS CSCL 09/3

The ideal reluctance synchronous machine with dual rotor windings is modeled mathematically and simulated on a digital computer. In addition, it is demonstrated that practical stability of the machine exists when the Liapunov theorem requirements have been met. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-23606*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FORMAL STRUCTURE FOR ADVANCED AUTOMATIC FLIGHT-CONTROL SYSTEMS

George Meyer and Luigi Cicolani Washington May 1975 39 p refs
(NASA-TN-D-7940; A-5710) Avail: NTIS HC $3.75 CSCL 01D

Techniques were developed for the unified design of multimode, variable authority automatic flight-control systems for powered-lift STOL and VTOL aircraft. A structure for such systems is developed to deal with the strong nonlinearities inherent in this class of aircraft, to admit automatic coupling with advanced air traffic control, and to admit a variety of active control tasks. The aircraft being considered is the augmentor wing jet STOL research aircraft. Author

N75-23607# Cranfield Inst. of Technology (England). Flight Div.
THE INFLUENCE OF SHORT SPRINGS ON LONGITUDINAL STATIC STABILITY
M. E. Eshelby Mar. 1975 41 p refs
(Cranfield-Aero-29) Avail: NTIS HC $3.75

The theory of springs as stability augmentors is discussed and comparison made between ideal long springs and the short springs more commonly found in light aircraft. Data and information from recent flight development trails are analysed to provide a practical demonstration of the effects produced. Author

N75-23608# Cornell Univ., Ithaca, N.Y. Sibley School of Mechanical and Aerospace Engineering.
RESEARCH ON HELICOPTER ROTOR NOISE Final Report, 2 Oct. 1973 - 31 Dec. 1974
A. R. George 10 Feb. 1975 17 p refs
(Contract DAHC04-74-C-0001)
(AD-A007261; ARO-9372-6-E) Avail: NTIS CSCL 01/3

During the period of this contract, research was carried out on three main aspects of helicopter rotor noise. These were the prediction of broadband noise due to random loadings, high speed blade noise, and noise due to the acceleration of solid bodies. The noise due to the acceleration of solid bodies was investigated experimentally and compared to calculations based on Farassat's results. The final results show excellent agreement between theory and experiment and a paper has been submitted to the Journal of Sound and Vibration reporting this work. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N75-23609# Lightning Elimination Associates, Downey, Calif.
DESIGN RECOMMENDATION FOR A LIGHTNING ELIMINATION SYSTEM FOR FAA CATEGORY 3 INSTRUMENT LANDING SYSTEM, NAFEC, ATLANTIC CITY, NEW JERSEY Final Report, Sep. - Dec. 1974
Dec. 1974 47 p refs
(Contract DOT-FA7WA-3555)
(AD-A008933; LEA-74-8; FAA-RD-75-45) Avail: NTIS HC $4.25

The design recommendations for a lightning elimination system are discussed. The phenomenon of point discharge is practically applied in the construction of dissipation arrays. The proposed design is for a paragon array to protect from lightning the localizer, glide slope inner marker, outer marker, far field monitor, remote control equipment, and power and control cables situated at an airport runway. Roof arrays, umbrella arrays, ground current collectors, and other subsystem design options are discussed. Author

N75-23610*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPARISON OF FLIGHT MEASUREMENTS WITH PREDICTIONS FROM AEROELASTIC MODELS IN THE NASA LANGLEY TRANSONIC DYNAMICS TUNNEL
Wilmer H. Reed, III May 1975 11 p refs Presented at the 46th AGARD Flight Mech. Panel Symp. on Flight/Ground Facility Correlation, Valloire, France, 9-12 Jun. 1975
(NASA-TM-X-72686) Avail: NTIS HC $3.25

The NASA Langley Transonic Dynamics Tunnel, which has a variable density, Freon-12 (or air) test medium, was designed to study the dynamics and aeroelastic problems of aerospace vehicles. During the operation of this facility there have been various opportunities to compare wind tunnel and flight test results. Some of these opportunities arise from routine flight checks of the prototype, others from carefully designed comparative wind tunnel and flight experiments. A collection of data obtained from various published and unpublished sources is presented. The topics covered are: gust and buffet response, control surface effectiveness, flutter, and active control of aeroelastic effects. Some benefits and shortcomings of Freon-12 as a test medium are also discussed. Although areas of uncertainty are evident and there is a continuing need for improvements in model simulation and testing techniques, the results presented herein indicate that predictions from aeroelastic model tests are, in general, substantiated by full-scale flight tests. Author

N75-23611*# Massachusetts Inst. of Tech., Cambridge. Fluid Dynamics Research Lab.
THE DEVELOPMENT OF EXPERIMENTAL TECHNIQUES FOR THE STUDY OF HELICOPTER ROTOR NOISE Final Report, Jun. 1973 - Nov. 1974
Sheila E. Widnall, Wesley L. Harris, Ying-Chieh Albert Lee, and Herman M. Drees Nov. 1974 89 p refs Sponsored in part by Army Air Mobility R and D Lab., Moffett Field, Calif.
(Contract NAS2-7684)
(NASA-CR-137684) Avail: NTIS HC $4.75 CSCL 14B

The features of existing wind tunnels involved in noise studies are discussed. The acoustic characteristics of the MIT low noise open jet wind tunnel are obtained by employing calibration techniques: one technique is to measure the decay of sound pressure with distance in the far field; the other technique is to utilize a speaker, which was calibrated, as a sound source. The sound pressure level versus frequency was obtained in the wind tunnel chamber and compared with the corresponding calibrated values. Fiberglas board-block units were installed on the chamber interior. The free field was increased significantly after this treatment and the chamber cut-off frequency was reduced to 160 Hz from the original designed 250 Hz. The flow field characteristics of the rotor-tunnel configuration were studied by using flow visualization techniques. The influence of open-jet shear layer on the sound transmission was studied by using an Aeolian tone as the sound source. A dynamometer system was designed to measure the steady and low harmonics of the rotor thrust. A theoretical Mach number scaling formula was developed to scale the rotational noise and blade slap noise data of model rotors to full scale helicopter rotors. Author

N75-23612# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
CONSTRUCTION OF A DYNAMIC AIRPORT SYSTEM
J. Boothby and N. Ashford Aug. 1974 57 p refs
(TT-7408) Avail: NTIS HC $4.25

The airport total system is composed of airlines, airport, and user interacting with each other and with the available environment. Requirements for a dynamic, inter-level system where component technology, configurations, and operational considerations can interact, are outlined. Inputs to and outputs from the system are considered. Author (ESRO)

N75-23613# Air Force Technical Applications Center, Washington, D.C. Foreign Technology Div.
REPAIR DOCK FOR LARGE AIRCRAFT
V. I. Mavrin, N. I. Prozorov, N. V. Grosvald, V. G. Tyapkin, G. F. Karnaukov, A. N. Skakhov, V. F. Blyuger, and V. B. Kaplun 19 Feb. 1975 10 p Transl. into ENGLISH from USSR Patent No. 328037, 2 Feb. 1972 p 1-3
(AD-A007399; FTD-HT-23-0850-75) Avail: NTIS CSCL 15/5

A repair dock for large aircraft characterized by (1) free rolling and rolling up of the right and left parts of the nose section; (2) convenience and safety when working in the landing

gear section; and (3) free passage of the cantilever of the rear section above the inner engine nacelle is described. J.M.S.

N75-23614# ARO, Inc., Arnold Air Force Station, Tenn.
NOISE GENERATION IN TRANSONIC WIND TUNNELS Final Report, Jun. 1973 - Jun. 1974
M. O. Varner AEDC Apr. 1975 40 p refs
(ARO Proj. VF409)
(AD-A007688; AEDC-TR-74-126) Avail: NTIS CSCL 14/2

In an attempt to determine the parameters characterizing the noise environment in transonic tunnels, noise-generating mechanisms for porous-wall tunnels with 60-deg inclined holes were isolated and studied. The noise environment in the test section is separated into three distinct parts: the noise due to jet flow through the porous walls, a wall hole-tunnel resonance phenomenon, and the turbulent boundary layer on the test section walls and in the diffuser. Each part is analyzed separately for the effects of aerodynamic and geometric flow constraints on the frequency and power characteristics. The contribution of each of the acoustic models to the test section free-stream fluctuating pressure level is also examined. GRA

N75-23615# ARO, Inc., Arnold Air Force Station, Tenn.
DEVELOPMENT OF HOLOGRAPHIC INTERFEROMETRIC APPLICATIONS IN THE VKF SUPERSONIC AND HYPERSONIC WIND TUNNELS Final Report, 1 Jul. 1973 - 20 Oct. 1974
W. T. Strike, J. E. OHare, and W. L. Templeton AEDC Apr. 1974 44 p refs
(ARO Proj. VF461; ARO Proj. V32Y-02A)
(AD-A007689; ARO-VKF-TR-74-103; AEDC-TR-75-1) Avail: NTIS CSCL 14/2

This report summarizes the progress achieved in the von Karman Gas Dynamics Facility (VKF) of the Arnold Engineering Development Center (AEDC), Air Force Systems Command (AFSC) to (1) improve the reconstruction process of holographic results, (2) develop diffuse, three-dimensional holography for use in the wind tunnel, and (3) prepare a data reduction program for converting interferometric results into meaningful static density distributions of a nonsymmetrical flow field. The report also contains some recommendations to make holography a more practical technique for recording optical results in the adverse environment existing around large supersonic and hypersonic wind tunnels. GRA

N75-23616# Air Force Flight Test Center, Edwards AFB, Calif.
AIR FORCE FLIGHT TEST CENTER TECHNOLOGY NEEDS. ANNUAL REPORT FOR CALENDAR YEAR 1974 Final Report
James L. Stehn Mar. 1975 16 p
(AF Proj. 9990)
(AD-A007840; AFFTC-TD-75-2) Avail: NTIS CSCL 15/5

This technology document presents all of the 1974 technology needs of the Air Force Flight Test Center in accordance with the definitions and requirements of AFSCR 80-29, Technology Need Program. The Technology Needs are: engineering anthropometric and biomedical evaluation of aircraft crew station geometries, vector missile miss distance indicator (to be installed in targets), automatic scoring system for air-to-air and air-to-ground gunnery, and an automatic bomb scoring system. GRA

N75-23617# General Dynamics/Fort Worth, Tex.
AIRCRAFT ENGINE NACELLE FIRE TEST SIMULATOR Final Report, 1 Apr. - 1 Dec. 1974
R. J. Springer Dec. 1974 237 p refs
(Contract F33615-74-C-2035; AF Proj. 3048)
(AD-A007853; AFAPL-TR-74-101) Avail: NTIS CSCL 01/3

The objective of this program was to develop design rationale, test criteria and complete detail design of an aircraft engine nacelle fire test simulator. The fabrication of a simulator from the detail design of this program will allow a more realistic investigation of engine nacelle fire problems and the evaluation of fire prevention hardware, detection and extinguishment systems generated by aircraft programs. The fabrication of the simulator was not a part of this program. This report documents the steps taken in defining the simulator design goals and requirements, conducting of preliminary design, trade-off studies, the selection of a final simulator configuration, and detail design of this simulator. GRA

N75-23618# Department of Transportation, Washington, D.C.
THE AIRPORT/URBAN INTERFACE Final Report, Jul. 1973 - Jun. 1974
Robert L. Paullin Jul. 1974 61 p refs
(PB-238914/6; DOT-TST-75-12) Avail: NTIS HC $4.25 CSCL 13B

A review was made of airport-urban interactions. Severe congetion at major airports is discussed as the limiting factor to increased capacity in the mid 1980's unless relieving action is taken. Existing DOT programs are examined and several suggestions are made for increased intermodal coordination as well as for specific R and D efforts. The need for intermodal planning is noted with priority given to solutions which minimize adverse environmental effects at the interface. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-23619*# National Aeronautics and Space Administration, Washington, D.C.
SPACE AND NUCLEAR RESEARCH AND TECHNOLOGY
Apr. 1975 12 p
(NASA-News-Release-75-95) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757 Baltimore/Washington Intern. Airport, Md. 21240 CSCL 22A

A fact sheet is presented on the space and nuclear research and technology program consisting of a research and technology base, system studies, system technology programs, entry systems technology, and experimental programs. Author

N75-23620*# Aerospace Corp., El Segundo, Calif.
MANNED SYSTEMS UTILIZATION ANAYLSIS. STUDY 2.1: SPACE SERVICING PILOT PROGRAM STUDY
R. R. Wolfe 30 Jan. 1975 54 p refs
(Contract NASw-2727)
(NASA-CR-142758; ATR-75(7361)-1) Avail: NTIS HC $4.25 CSCL 22A

Space servicing automated payloads was studied for potential cost benefits for future payload operations. Background information is provided on space servicing in general, and on a pilot flight test program in particular. An fight test is recommended to demonstrate space servicing. An overall program plan is provided which builds upon the pilot program through an interim servicing capability. A multipayload servicing concept for the time when the full capability tug becomes operational is presented. The space test program is specifically designed to provide low-cost booster vehicles and a flight test platform for several experiments on a single flight. L.R.B.

N75-23621*# Kanner (Leo) Associates, Redwood City, Calif.
THE APOLLO-SOYUZ TEST FLIGHT
A. A. Leonov Washington NASA Jun. 1975 9 p Transl. into ENGLISH from Zemlya i vselennaya (USSR), no. 2, Mar.-Apr. 1974 p 13-17
(Contract NASw-2481)
(NASA-TT-F-16386) Avail: NTIS HC $3.25 CSCL 22A

Cosmonaut A.A. Leonov, designated Soviet crew commander for the ASTP flight, reviews the flight program and relates some of his impressions of the Houston Space Center. The flight mission is to complete rendezvous and docking; the solar eclipse experiment is also mentioned. Leonov briefly compares the Soyuz and Apollo spacecraft, discussing differences in astronaut versus cosmonaut training. He feels some Apollo components are superfluous and that some components are more fully executed on the Soyuz. Author

N75-23622*# Kanner (Leo) Associates, Redwood City, Calif.
THE SOYUZ AND APOLLO SPACECRAFT
I. Yudin Washington NASA Jun. 1975 22 p Transl. into ENGLISH from Nauka Zhin (USSR), no. 3, Mar. 1975 p 36-43

(Contract NASw-2481)
(NASA-TT-F-16371) Avail: NTIS HC $3.25 CSCL 22B

The Soyuz and Apollo spacecrafts, as well as the docking module, are extensively described. The exterior structure and interior design of the two spacecrafts are discussed in detail. The Soyuz consists of a reentry module, an orbit module, and an instrument-system module, while the Apollo consists of a command module, a service module, and a docking or transfer module. Author

N75-23623*# National Aeronautics and Space Administration, Washington, D.C.
APOLLO SOYUZ TEST PROJECT PRESS KIT: USA-USSR
10 Jun. 1975 120 p refs
(NASA-News-Release-75-118) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757 Baltimore/Washington Intern. Airport, Md. 21240 CSCL 22A

The goals and program of the mission are described. Operations from preflight crew training through splashdown are included. Spacecraft and launch vehicle configurations are given. The 27 joint and unilateral experiments to be performed are described. A flight plan and a schedule of activities is included, together with brief crew biographies. The ground support system is discussed; it includes control centers in Houston and Moscow, and an ATS satellite to relay ground-air-ground communications. The global tracking network and the television transmission system are also described. L.B.

N75-23624*# Battelle Columbus Labs., Ohio.
UNDERCOOLING OF MATERIALS DURING SOLIDIFICATION IN SPACE Final Report, Jul. 1973 - Feb. 1975
D. P. Moak, N. M. Griesenauer, and S. H. Gelles 18 Apr. 1975 72 p refs
(Contract NAS8-28749)
(NASA-CR-120750) Avail: NTIS HC $4.25 CSCL 22A

The theoretical and actual effect of undercooling on molten materials below the equilibrium solid us temperature was studied. Materials in the categories of pure metals, alloys, and compounds were examined: their commercial and scientific value and past experience in their undercooling were considered. The material properties influencing undercooling behavior are reviewed, specified, and categorized. The effects of gravity and its absence are investigated. It is shown that presence of heterogeneous nucleating agents is the main obstacle to achieving a large degree of undercooling. L.B.

N75-23625*# Joint Publications Research Service, Arlington, Va.
IN OUTER SPACE
I. G. Borisenko Washington NASA May 1975 126 p refs Transl. into ENGLISH from the book "V. Otkrytom Kosmose" Moscow, Mashinostroyeniye Press, 1974 p 1-159
(NASA Order W-13183)
(NASA-TT-F-16252) Avail: NTIS HC $5.75 CSCL 22A

A book describing the world's first space walk is discussed. Data cover all stages of preparation of cosmonauts P. I. Belyayev and A. A. Leonov. Descriptions are also given of the space walks by A. S. Yeliseyev, Ye. V. Khrunov and American astronauts. Author

N75-23626# Hydromecanique et Frottement, Andrezieux (France). Centre Stephanois de Recherches Mecaniques.
POSSIBLE APPLICATIONS OF SURFACE TREATMENT TO ULTRAHIGH VACUUM FRICTION FOR SPACE UTILIZATION [POSSIBILITES D'APPLICATIONS DES TRAITEMENTS DE SURFACE AU FROTTEMENT SOUS ULTRA-VIDE POUR UTILISATIONS SPATIALES]
J. L. Polti Paris ESRO 1975 27 p In FRENCH Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975 Sponsored by CNES
Avail: NTIS HC $3.75

Tests were carried out to investigate the use of surface treatments in resolving the problem of ultrahigh vacuum dry friction. The following solutions are indicated: couple metals with compatible friction, such as copper on molybdenum, or copper on tungsten,stainless steel on silver, or lead, or indium: diffuse layers, based for instance on copper and indium, to provide indium to the surface; and have solid lubricant layers, obtained by in situ synthesis at the surface of metal parts. ESRO

N75-23627*# International Business Machines Corp., Huntsville, Ala.
ASTRIONIC SYSTEM OPTIMIZATION AND MODULAR ASTRIONICS FOR NASA MISSIONS AFTER 1974. PRELIMINARY DEFINITION OF ASTRIONIC SYSTEM FOR SPACE TUG MISSION VEHICLE PAYLOAD (MVP) Progress Report, 16 Jun. - 15 Aug. 1970
15 Aug. 1970 563 p refs
(Contract NAS6-14000)
(NASA-CR-120618; IBM-69-K44-0006H) Avail: NTIS HC $13.00

Results of preliminary studies to define the space tug astrionic system, subsystems, and components to meet requirements for a variety of missions are reported. Emphasis is placed on demonstration of the modular astrionics approach in the design of the space tug astrionic system. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-23628 Purdue Univ., Lafayette, Ind.
MINIMUM-TIME RESCUE TRAJECTORIES BETWEEN SPACECRAFT IN CIRCULAR ORBITS Ph.D. Thesis
Burton Howard Holaday 1974 136 p
Avail: Univ. Microfilms Order No. 75-10891

Optimal space trajectories to be flown by a rescue vehicle so as to rendezvous with a distressed spacecraft in minimum time are investigated. Nonlinear equations describing the inverse square gravitational field are used, and large transfer angles are considered. The rocket thrust of the rescue vehicle is allowed to vary between zero and a specified upper limit. The distressed vehicle is passive. Both vehicles are initially in circular orbits, but not necessarily at the same altitude nor in the same plane. Atmospheric effects are neglected, but the minimum altitude of the rescue craft is restricted by introducing a state-variable constraint. It is found that the optimal trajectories may contain coasting arcs and that arcs lying along the state-variable constraint may be arcs of intermediate thrust. A parametric study is made using a presently proposed space tug as the rescue vehicle. The results indicate that minimum-time trajectories could be satisfactorily flown by the tug in a low earth orbit rescue effort. Dissert. Abstr.

N75-23629*# Intermetrics, Inc., Cambridge, Mass.
POST-TEST NAVIGATION DATA ANALYSIS TECHNIQUES FOR THE SHUTTLE ALT Final Report
15 Apr. 1975 96 p
(Contract NAS9-13902)
(NASA-CR-141789; IR-109-75) Avail: NTIS HC $4.75 CSCL 17G

Postflight test analysis data processing techniques for shuttle approach and landing tests (ALT) navigation data are defined. Postflight test processor requirements are described along with operational and design requirements, data input requirements, and software test requirements. The postflight test data processing is described based on the natural test sequence: quick-look analysis, postflight navigation processing, and error isolation processing. Emphasis is placed on the tradeoffs that must remain open and subject to analysis until final definition is achieved in the shuttle data processing system and the overall ALT plan. A development plan for the implementation of the ALT postflight test navigation data processing system is presented. Conclusions are presented. Author

N75-23630*# General Electric Co., Beltsville, Md. GE LANDSAT Operation Control Center.
LANDSAT-2 LAUNCH AND FLIGHT ACTIVATION. LAUNCH THROUGH ORBIT 50 AND ORBIT ADJUST OPERATION Evaluation Report, 22-26 Jan. 1975
21 Mar. 1975 263 p
(Contract NAS5-21808)

(NASA-CR-143744; Doc-75SD4215) Avail: NTIS HC $8.50 CSCL 22C

The results of the analysis conducted on the telemetry data from the prelaunch, launch, and flight activation phases of LANDSAT-2 spacecraft are presented according to subsystems and interrelationships that exist between subsystems. Subsystem characteristics are included along with the flight evaluation results. Flight data are compared to baseline data established at the 20 C plateau during thermal vacuum testing of the spacecraft. Evaluation guidelines are derived from the specifications developed from the LANDSAT program objectives: (1) acquisition of multispectral images of the surface of the earth; and (2) use of the LANDSAT-2 receiving, frequency translating, and transmitting equipment as a relay system to gather data from fixed earth-based sensor platforms which are operated by individual investigators. Data are presented on the first 50 orbits of the spacecraft. Author

N75-23631*# Kanner (Leo) Associates, Redwood City, Calif.
OPERATION OF DESCENT MODULE OF THE MARS-6 AUTOMATIC INTERPLANETARY STATION IN THE MARTIAN ATMOSPHERE
S. S. Sokolov, V. G. Fokin, V. P. Burtsev, R. S. Romanov, M. K. Rozhdestvenskiy, V. P. Karyagin, N. F. Borodin, V. F. Ivannikov, V. I. Shkirina, L. V. Nikolayenko et al Washington NASA May 1975 12 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 9-15
(Contract NASw-2481)
(NASA-TT-F-16334) Avail: NTIS HC $3.25 CSCL 22C

The descent module of the Mars 6 automatic interplanetary station is discussed as it entered Martian atmosphere at the velocity 5600 m/sec. After aerodynamic braking on attainment of approximately 600 m/sec, the parachute system was activated. The descent module of the Mars 6 reached the Martian surface in a region with nominal coordinates 23.9 deg S. lat. and 19.5 deg W. long. The descent period, from atmospheric entry and aerodynamic braking to parachute-assisted descent, took 5.2 min. Author

N75-23632*# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
ANALYSIS OF RAE-B ATTITUDE DATA Final Report
David A. Hedland and Paul K. DeGonia [1975] 31 p
(Contract NAS5-20083)
(NASA-CR-143793) Avail: NTIS HC $3.75 CSCL 22C

Attempts made to obtain a description of the in-orbit dynamic behavior of the RAE-B spacecraft and account for the discrepancies between predicted and actual in-orbit performance are reported. In particular, attitude dynamics during the final despin operations in lunar orbit, throughout all deployment operations, and into the final steady state mission mode were investigated. Attempts made to match computer simulation results to the observed equilibrium data are discussed. Due to a damaged antenna boom and the unavailability of sufficient attitude and dynamics data, most of the objectives were not realized. Author

N75-23633*# Kanner (Leo) Associates, Redwood City, Calif.
COLLECTION OF PROBLEMS ON THE DYNAMICS OF A POINT IN A CENTRAL FORCE FIELD
Yelena Nikolayevna Polyakhova Washington NASA May 1975 169 p refs Transl. into ENGLISH from the book "Sbornik Zadach po Dinamike Tochki v Pole Tsentral'nykh sil" Leningrad, Leningrad Univ. Press, 1974 p 1-145
(Contract NASw-2481)
(NASA-TT-F-16263) Avail: NTIS HC $6.25 CSCL 16B

A detailed selection of problems on the dynamics of the motion of a material point acted on by a central gravitational force, in particular, the dynamics of space flight is presented along with several problems on the motion of a point acted on by central nongravitational forces. Topics covered include Kepler's laws, Binet's formulas for central forces, the energy balance and velocity along a space trajectory, time of motion along a space trajectory, conditions for the existence of elliptical trajectories, transfer from orbit to orbit, sphere of action, third escape velocity problems, two-body problem, and the generalized third law of Kepler. Author

N75-23634*# Kanner (Leo) Associates, Redwood City, Calif.
FORTRAN PROGRAM FOR CALCULATING THE TRAJECTORY OF PROJECTILES
Nils Gylden and Ake Johnson Washington NASA May 1975 21 p refs Transl. into ENGLISH from Swedish report FOA-2-A-2564-D8, Dec. 1972 20 p
(Contract NASw-2481)
(NASA-TT-F-16316) Avail: NTIS HC $3.25 CSCL 19D

A FORTRAN program is described for numerical calculation of projectiles' trajectories with two degrees of aeromechanical freedom. Dupuis' law of air resistance is applied under OB [expansion unknown] standard atmospheric conditions. A time step is selected with regard to initial velocity and air resistance and adapted to the trajectory. The program is considered to be cost effective when many trajectories are to be calculated. Agreement with firing tables is shown to be good. Author

N75-23635*# Analytical Mechanics Associates, Inc., Seabrook, Md.
STUDY TO DOCUMENT LOW THRUST TRAJECTORY OPTIMIZATION PROGRAMS HILTOP AND ASTOP
Jerry L. Horsewood, Frederick I. Mann, and Samuel Pines Dec. 1974 36 p refs
(Contract NAS8-29945)
(NASA-CR-120767; AMA-74-32) Avail: NTIS HC $3.75 CSCL 22C

Detailed documentation of the HILTOP and ASTOP computer programs is presented along with results of the analyses of the possible extension of the HILTOP program and results of an extra-ecliptic mission study performed with HILTOP. Author

N75-23636*# Kanner (Leo) Associates, Redwood City, Calif.
GRAPHICS OF SPACE MECHANICS [ANALYTICAL-GRAPHICAL METHODS IN SPACE NAVIGATION]
Georgiy Alekseyevich Yazvitskiy Washington NASA May 1975 126 p refs Transl. into ENGLISH of the book "Kosmicheskaya Grafomekhanika" Moscow, Mashinostroyeniye Press, 1975 128 p
(Contract NASw-2481)
(NASA-TT-F-16298) Avail: NTIS HC $5.75 CSCL 22C

A set of geometrical methods of solving problems in space flight mechanics is presented. These methods make it possible, without complicated mathematical equipment, to investigate space flight and to perform practical calculations (i.e. flight trajectories) with varying degrees of accuracy. Author

N75-23637*# Kanner (Leo) Associates, Redwood City, Calif.
ESSENTIALS OF THE THEORY OF FLIGHT AND ELEMENTS OF DESIGNING ARTIFICIAL EARTH SATELLITES
M. K. Tikhonravov, I. K. Bazhinov, O. V. Gurko, G. Yu. Maksimov, and I. M. Yatsunskiy Washington NASA Jun. 1975 365 p refs Transl. into ENGLISH of the book "Osnovy teorii poleta i elementy proyektirovaniya iskusstvennykh sputnikov zemli" Moscow, Mashinostroyeniye Press, 1974 p 1-331 Revised
(Contract NASw-2481)
(NASA-TT-F-16220) Avail: NTIS HC $10.00 CSCL 22C

The basic concepts of the unperturbed (Keplerian) motion of a satellite are discussed. The effect on satellite motion of the following principal perturbing factors is analyzed: errors of satellite insertion into orbit, noncentrality of the earth's gravitational field, air drag, anomalies of gravitational force, attraction of moon and sun, and solar wind pressure. The basic methods of determining satellite orbits from measurements are given. Problems of inserting artificial earth satellites into orbit and deorbiting to the earth's surface are examined. The essentials of flight theory are expounded with reference to the necessity of selecting the optimal ballistic-design parameters when designing spacecraft. Author

N75-23638# European Space Research Organization, Paris (France).
CONTRIBUTIONS TO THE CALCULATION OF SATELLITE TRANSFER FROM NEAR-EARTH TO GEOSTATIONARY ORBITS BY SMALL THRUST-ACCELERATION IN REGULARISED VARIABLES
Feb. 1975 150 p refs Transl. into ENGLISH of 'Beitr. zur Berechnung von Satellitenuebergaengen aus erdnahen Parkbahnen in die geostationaere Lage bei schwacher Schubbeschleunigung

in regularisierten Variablen" DFVLR, Porz, West Ger. Report DLR-FB-74-57, 22 Jul. 1974 Original German report available from DFVLR, Porz, West Ger. 34 DM
(ESRO-TT-138; DLR-FB-74-57) Avail: NTIS HC $5.75

The behavior of a satellite in the Newtonian central field under the influence of small thrust accelerations in tangential, horizontal, and radial direction was investigated. Motion is described by one real and one complex variable. Time appears as a dependent variable in a separated equation. The independent variable is closely connected to the eccentric anomaly. The solutions of the equation of motion, except for time, are calculated up to secular terms of second order. Transition paths from near earth parking orbits to geostationary orbits are calculated.
Author (ESRO)

N75-23639# European Space Operations Center, Darmstadt (West Germany).
PERTURBATION OF A PLANETARY ORBITER BY RADIATION PRESSURE, ACCOUNT BEING TAKEN OF VARIATION IN THE DISTANCE AND DIRECTION OF THE SUN
E. A. Roth Paris ESRO Nov. 1974 26 p refs
(ESRO-SR-24-ESOC) Avail: NTIS HC $3.75

The variation in the orbital elements of a Mercury space probe perturbed by direct solar-radiation pressure is derived for a general case in which the distance and direction of the sun vary.
ESRO

N75-23640# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPTIMUM CONTROL OF FLIGHT VEHICLE UNDER THE CONDITIONS OF UNCERTAINTY
Yu. N. Zhelnin 13 Feb. 1975 26 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 2, no. 2, 1971 p 50-57
(AD-A007400; FTD-MT-24-0345-73) Avail: NTIS CSCL 16/2

Optimum steering of flight vehicles in the presence of unknown disturbance/perturbation and incomplete information about the current phase coordinates was examined. For the solution of the problem, methods from the theory of differential plays were utilized. Hypersonic vehicle optimum path control upon atmospheric entry was determined and the structure of optimum control and most unfavorable disturbance/perturbation for one class of entry trajectories were given. Data were obtained by airborne measuring devices from the flight vehicles and the variational principle.
Author

N75-23641# Air Force Technical Applications Center, Washington, D.C. Foreign Technology Div.
APPROXIMATE OPTIMUM CONTROL OF THE ANGLE OF ROLL IN THE PROBLEM OF THE REENTRY OF HYPERSONIC VEHICLES
V. I. Pashintsev 4 Feb. 1975 35 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 4, 1972 p 136-144
(AD-A007456; FTD-MT-24-0560-75) Avail: NTIS CSCL 16/2

Reentry of a hypersonic aircraft in the coast phase of flight to a specified area is considered. A convenient form of writing the conditions for selection of the optimum angle of roll is given along with characteristic properties of optimum control. A simplified program is developed, based on an approximate qualitative analysis of optimum control, for controlling the angle of roll defined by the function of the instant values of the phase coordinate and a single variable parameter.
Author

N75-23642# Air Force Armament Lab., Eglin AFB, Fla.
INVARIANT DYNAMICS OF FLIGHT VEHICLES UNDER ROTATING REFERENCE FRAMES Final Report, Jan. - Jun. 1974
Peter H. Zipfel Oct. 1974 24 p refs
(AD-A007671; AFATL-TR-74-169) Avail: NTIS CSCL 22/3

A tensor formalism is introduced for the concise presentation of the equations of motion of flight vehicles. Two new concepts, the rotational time derivative and the generalized Euler transformation, enable a formulation of the equations of motion that is invariant under time-dependent coordinate transformations. Several dynamic equations are derived for non-inertial reference frames and arbitrary points of reference. As an application, the new concepts are employed to provide an alternate derivation of the equations of motion for dual-spin spacecraft and thus to clarify the proper transformation of vector time derivatives. GRA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N75-23643# Army Scientific Advisory Panel, Washington, D.C.
REPORT OF THE ARMY SCIENTIFIC ADVISORY PANNEL AD HOC GROUP ON WHITE SANDS MISSILE RANGE INSTRUMENTATION
Feb. 1975 21 p
(AD-A007836) Avail: NTIS CSCL 16/1

An ad hoc group was convened by the Army Scientific Advisory Panel Executive Committee to review the instrumentation capability at White Sands Missile Range. The terms of reference for the group were: the rapid growth and technological change in instrumentation, simulation, and data reduction systems over the past few years dictate an evaluation and an assessment of the current capability at White Sands Missile Range in regard to instrumentation, data handling, and test evaluation capabilities. It is necessary to know whether the system at this facility compares favorably with other systems in the U.S. and whether the U.S. has not just adequate, but fully capable equipment economically to carry out effective testing on present and envisioned weapons systems, particularly such sophisticated systems as SAM-D.
GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-23644*# National Aeronautics and Space Administration, Washington, D.C.
REPORT TO THE ADMINISTRATOR BY THE NASA AEROSPACE SAFETY ADVISORY PANEL ON THE SKYLAB PROGRAM. VOLUME 1: SUMMARY REPORT
Jan. 1973 42 p 2 Vol.
(NASA-TM-X-66814) Avail: NTIS HC $3.75 CSCL 22B

Contractor and NASA technical management for the development and manufacture of the Skylab modules is reviewed with emphasis on the following management controls: configuration and interface management; vendor control; and quality control of workmanship. A review of the modified two-stage Saturn V launch vehicle which focused on modifications to accommodate the Skylab payload; resolution of prior flight anomalies; and changes in personnel and management systems is presented along with an evaluation of the possible age-life and storage problems for the Saturn 1-B launch vehicle. The NASA program management's visibility and control of contractor operations, systems engineering and integration, the review process for the evaluation of design and flight hardware, and the planning process for mission operations are investigated. It is concluded that the technical management system for development and fabrication of the modules, spacecraft, and launch vehicles, the process of design and hardware acceptance reviews, and the risk assessment activities are satisfactory. It is indicated that checkout activity, integrated testing, and preparations for and execution of mission operation require management attention.
J.M.S.

N75-23645*# National Aeronautics and Space Administration, Washington, D.C.
REPORT TO THE ADMINISTRATOR BY THE NASA AEROSPACE SAFETY ADVISORY PANEL ON THE SKYLAB PROGRAM. VOLUME 2: PROGRAM IMPLEMENTATION AND MATURITY

Jan. 1973 180 p refs 2 Vol.
(NASA-TM-X-66815) Avail: NTIS HC $7.00 CSCL 22B

Results of the design and manufacturing reviews on the maturity of the Skylab modules are presented along with results of investigations on the scope of the cluster risk assessment efforts. The technical management system and its capability to assess and resolve problems are studied. Author

N75-23646*# Kanner (Leo) Associates, Redwood City, Calif.
THE SOYUZ: READY FOR FLIGHT
A. Filipchenko Washington NASA Jun. 1975 9 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 3, Mar. 1975 p 38-39
(Contract NASw-2481)
(NASA-TT-F-16369) Avail: NTIS HC $3.25 CSCL 22A

A December flight of the Soyuz spacecraft was made to test changes in preparation for the joint flight of the Soyuz-Apollo. The experiments and tests conducted are described in detail, and are pronounced successful. The problems of rendezvous and docking of spacecraft from different countries are discussed and the need for systems compatibility is emphasized. Author

N75-23647*# Chrysler Corp., New Orleans, La. Space Div.
AIRLOADS INVESTIGATION OF AN 0.030 SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 9 BY 7 FOOT UNITARY PLAN WIND TUNNEL FOR MACH 1.55 AND 2.2 (IA14B), VOLUME 1
R. L. Gillins (Rockwell Intern. Corp., Downey, Calif.) Apr. 1975 549 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-141522; DMS-DR-2129-Vol-1) Avail: NTIS HC $12.50 CSCL 22B

Tests were conducted in September, 1973 on a launch vehicle configuration consisting of a space shuttle orbiter, an external tank, two solid rocket boosters, and associated intercomponent attach hardware. Model variables included elevon, rudder, and speed brake deflections. Aerodynamic loads were measured and surface pressure distributions were obtained simultaneously with six-component stability and control force data on the complete configuration. Angles of attack and sideslip were also investigated. Author

N75-23648*# Chrysler Corp., New Orleans, La. Space Div.
AIRLOADS INVESTIGATION OF AN 0.030 SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 9 BY 7 FOOT UNITARY PLAN WIND TUNNEL FOR MACH 1.55 AND 2.2 (IA14B), VOLUME 2
R. L. Gillins (Rockwell Intern. Corp., Downey, Calif.) Apr. 1975 806 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-141523; DMS-DR-2129-Vol-2) Avail: NTIS HC $19.25 CSCL 22B
For abstract, see N75-23647.

N75-23649*# Chrysler Corp., New Orleans, La. Space Div.
AIRLOADS INVESTIGATION OF AN 0.030 SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B ORBITER CONFIGURATION (MODEL 47-0) IN THE 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH 0.6 AND 0.9 (0A22A)
R. L. Gillins (Rockwell Intern. Corp., Downey, Calif.) Apr. 1975 709 p refs
(Contract NAS9-13247)
(NASA-CR-141529) Avail: NTIS HC $17.25 CSCL 22B
For abstract, see N75-23647.

N75-23650*# Chrysler Corp., New Orleans, La. Space Div.
AIRLOADS INVESTIGATION OF AN 0.030 SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B ORBITER CONFIGURATION (MODEL 47-0) IN THE ARC 9 BY 7-FOOT UNITARY PLAN WIND TUNNEL FOR MACH 1.55 AND 2.2 (0A22B)
R. L. Gillins (Rockwell Intern. Corp., Downey, Calif.) Apr. 1975 762 p refs
(Contract NAS9-13247)
(NASA-CR-141530; DMS-dr-2131) Avail: NTIS HC $17.25 CSCL 22C
For abstract, see N75-23647.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N75-23651*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ABORT SEPARATION STUDY OF A SHUTTLE ORBITER AND EXTERNAL TANK AT HYPERSONIC SPEEDS
Peter T. Bernot Washington May 1975 49 p refs
(NASA-TM-X-3212; L-10073) Avail: NTIS HC $3.75 CSCL 22C

The effects of several parameters on the relative motions of a space shuttle orbiter design and its external tank were determined during staging for the return-to-launch-site abort mode. The parameters included angle of attack, dynamic pressure, flight-path angle, pitch rate, elevon effectiveness and the use of thrust applied to the tank. The relative positions of each component were determined by a separation trajectory computer program which incorporated data obtained in wind-tunnel tests with the orbiter and tank in proximity. These tests were conducted at Mach 10.3 in a continuous-flow hypersonic tunnel. All separation cases were initiated at a constant Mach number of 10 with an assumed sideslip angle of 0 deg. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N75-23652*# Hughes Aircraft Co., Culver City, Calif. Space and Communications Group.
EXPERIMENT DEFINITION PHASE SHUTTLE LABORATORY LDRL-10.6 EXPERIMENT Quarterly Report, 26 Sep. - 26 Dec. 1974
15 Jan. 1975 72 p refs
(Contract NAS5-20018)
(NASA-CR-143746; HAC-Ref-D0824; SCG-50039R; QR-2) Avail: NTIS HC $4.25 CSCL 17H

The acquisition and tracking links of shuttle to molniya satellite and shuttle to ground are established. Link parameters and tolerance are analyzed. A 10-micromillimeter optomechanical subsystem brassboard model was designed and measured for optical properties and weight optimization. The design incorporates an afocal rotating Gregorian telescope in a two-gimbal berylium structure with beam steering control mechanisms. Parameters for both the optomechanical subsystem and spaceborne terminals are included. L.B.

N75-23653*# Delco Electronics, Santa Barbara, Calif.
SOURCE ENCODING FOR ORBITER COMMUNICATIONS LINKS Final Report
May 1975 116 p
(Contract NAS9-14402)
(NASA-CR-141792; R75-34) Avail: NTIS HC $5.25 CSCL 17B

The feasibility of using data compression to improve link efficiency as an alternative to increased transmitter power, reducing receiver noise figures, increasing antenna gain through more stringent orbiter attitude constraints, etc. is studied. A method of encoding digital data is developed which permits low band-width encoding as well as a unique system of adaptive run length encoding. The effectiveness of these techniques for

the air-to-ground link and for the bandwidth-limited ground-to-ground data link used for the orbiter downlink data is evaluated. Results are presented. Author

N75-23654*# Analytic Sciences Corp., Reading, Mass.
SPACE SHUTTLE ENTRY AND LANDING NAVIGATION ANALYSIS Final Report
Harold L. Jones and Bard S. Crawford 31 Jul. 1974 251 p refs
(Contract NAS9-12968)
(NASA-CR-141765; TR-302-2) Avail: NTIS HC $8.50 CSCL 23C

A navigation system for the entry phase of a Space Shuttle mission which is an aided-inertial system which uses a Kalman filter to mix IMU data with data derived from external navigation aids is evaluated. A drag pseudo-measurement used during radio blackout is treated as an additional external aid. A comprehensive truth model with 101 states is formulated and used to generate detailed error budgets at several significant time points -- end-of-blackout, start of final approach, over runway threshold, and touchdown. Sensitivity curves illustrating the effect of variations in the size of individual error sources on navigation accuracy are presented. The sensitivity of the navigation system performance to filter modifications is analyzed. The projected overall performance is shown in the form of time histories of position and velocity error components. The detailed results are summarized and interpreted, and suggestions are made concerning possible software improvements. Author

N75-23655# Communications Research Centre, Ottawa (Ontario).
COMMUNICATIONS EXPERIMENTER'S GUIDE. COMMUNICATIONS TECHNOLOGY SATELLITE
R. W. Huck Feb. 1975 124 p
(CRC-TN-671(CS-03-01)) Avail: NTIS HC $5.25

The technical and operational aspects of the CTS satellite, the associated ground terminals, and the communications capabilities of the combined system are described. This information is provided for use in the detailed planning of individual experiments and to specify some of the divisions of responsibility between the government and the experiment. Author

N75-23656*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESULTS OF THE 3 NOVEMBER 1974 APPLICATIONS TECHNOLOGY SATELLITE-6 (ATS-6) TRILATERATION TEST
P. E. Schmid and J. J. Lynn (Old Dominion Systems, Inc.) Apr. 1975 33 p refs Submitted for publication
(NASA-TM-X-70897; X-932-75-104) Avail: NTIS HC $3.75 CSCL 22B

The highly successful 24 hour trilateration tracking and orbit determination test conducted on 3 November 1974 is described. In this test a new method of accurately computing geostationary spacecraft orbits was applied to the Applications Technology Satellite (ATS-6). A single tracking station interrogates several strategically deployed ground based transponders via the synchronous satellite whose orbit is to be determined. The ATS-6 tracking data measurement noise over the 24 hour period was observed to be 0.3 mm/sec in range rate and 1.5 meters in range. By means of overlap orbit computation using 2 separate tracking data bases, the ATS-6 total position and velocity uncertainties were determined to reach a minimum of 30 meters and 0.2 cm/sec respectively. The maximum position and velocity uncertainty over this same time period was determined to be approximately 250 meters and 2 cm/sec respectively. A position determination using simultaneous tracking of the NASA-GSFC site by ATS-6 and ATS-3 was also performed. Station location recovery was to an accuracy on the order of 100 meters over the first 10 hours of tracking. G.G.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N75-23657*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 3
R. L. Gillins (Rockwell Intern., Downey, Ca.) Mar. 1975 990 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-134445; DMS-DR-2084-Vol-3) Avail: NTIS CSCL 22B

Results of tests conducted on an 0.030 scale launch configuration model of the space shuttle vehicle 140A/B in the NASA/ARC 11-foot unitary plan wind tunnel are presented. Aerodynamic loads data were obtained at Mach numbers from 0.6 to 1.4. Surface pressure distributions were obtained simultaneously with six-component stability and control force data on the complete launch configuration. The configuration consisted of the orbiter, an external tank, two solid rocket boosters, and associated intercomponent attach hardware. Angles of attack and sideslip from -10 degrees to +10 degrees were investigated. Pressure data on the orbiter fuselage and orbiter base are presented in tabular form. For Vol. I, see N75-20456. For Vol. II, see N75-19337. Author

N75-23658*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 4
R. L. Gillins (Rockwell Intern., Downey, Calif.) Mar. 1975 706 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-134446; DMS-DR-2084-Vol-4) Avail: NTIS CSCL 22B

Pressure data are presented in tabular form on the OMS nozzle, the body flap, and the Oms pod outside of the space shuttle launch vehicle configuration model. For Vol. III, see N75-23657. J.M.S.

N75-23659*# Chrysler Corp., New Orleans, La. Space Div.
AIRLOADS INVESTIGATION OF AN 0.30-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 5
R. L. Gillins (Rockwell Intern., Downey, Calif.) Mar. 1975 957 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-134447; DMS-DR-2084-Vol-5) Avail: NTIS HC $21.25 CSCL 22B

Pressure data are presented in tabular form on the lower wing surface of the space shuttle launch vehicle configuration model. For Vol. III, see N75-23657. J.M.S.

N75-23660*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 6
R. L. Gillins (Rockwell Intern. Space Div.) Mar. 1975 956 p refs 11 Vol.

(Contract NAS9-13247)
(NASA-CR-134448; DMS-DR-2084-Vol-6) Avail: NTIS HC $21.25 CSCL 22B

Pressure data are presented in tabular form on the upper wing surface of the space shuttle launch vehicle configuration model. For Vol. III, see N75-23657. J.M.S.

N75-23661*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030 SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 7
R. L. Gillins (Rockwell Intern. Corp.) Mar. 1975 685 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-134449; DMS-DR-2084-Vol-7) Avail: NTIS HC $15.25 CSCL 22B

Pressure data are presented in tabular form on the left and right vertical tail surface of the space shuttle launch vehicle configuration model. For Vol. III, see N75-23657. J.M.S.

N75-23662*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 8
R. L. Gillins (Rockwell Intern. Corp.) Mar. 1975 608 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-134450; DMS-DR-2084-Vol-8) Avail: NTIS HC $15.25 CSCL 22B

Pressure data are presented in tabular form on the SRM booster of the space shuttle launch vehicle configuration model. For Vol. III, See N75-23657. J.M.S.

N75-23663*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 9
R. L. Gillins (Rockwell Intern. Corp.) Mar. 1975 789 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-141501; DMS-DR-2084-Vol-9) Avail: NTIS HC $17.25 CSCL 22B

Pressure data are presented in tabular form on the external tank and the SRM nozzle of the space shuttle launch vehicle configuration model. For Vol. III, See N75-23657. J.M.S.

N75-23664*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140 A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 10
R. L. Gillins (Rockwell Intern. Corp.) Mar. 1975 853 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-141502; DMS-DR-2084-Vol-10) Avail: NTIS HC $19.25 CSCL 22B

Pressure data are presented in tabular form on the external tank base and SRM booster base of the space shuttle launch vehicle configuration model. For Vol. III, see N75-23657. J.M.S.

N75-23665*# Chrysler Corp., New Orleans, La. Data Management Services.
AIRLOADS INVESTIGATION OF AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 140A/B LAUNCH CONFIGURATION (MODEL 47-OTS) IN THE ARC 11-FOOT UNITARY PLAN WIND TUNNEL FOR MACH RANGE 0.6 TO 1.4 (IA14A), VOLUME 11
R. L. Gillins (Rockwell Intern. Space Div.) Mar. 1975 544 p refs 11 Vol.
(Contract NAS9-13247)
(NASA-CR-141503; DMS-DR-2084-Vol-11) Avail: NTIS HC $12.50 CSCL 22B

Pressure data are presented in tabular form on the external tank attach points and the external tank base rake of the space shuttle launch vehicle configuration model. For Vol. III, see N75-23657. J.M.S.

N75-23666*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TRANSONIC WIND TUNNEL TESTS ON AN 0.010-SCALE SPACE SHUTTLE MATED VEHICLE MODEL 72-OTS IN THE LaRC 8-FOOT TPT (IA43)
M. T. Petrozzi (Rockwell International Corp., Downey, Calif.) and M. D. Milam (Rockwell International Corp., Downey, Calif.) Apr. 1975 397 p
(Contract NAS9-13247)
(NASA-CR-141525; DMS-DR-2204) Avail: NTIS HC $10.25 CSCL 22B

Experimental aerodynamic investigations were conducted in NASA/Langley 8-Foot transonic pressure tunnel on a sting mounted 0.010-scale outer mold line model of 104A/B configuration of the Rockwell International space shuttle vehicle. Component aerodynamic force and moment data and base and balance cavity pressures were recorded over an angle of attack range of -10 deg to +10 deg at Mach numbers of 0.6, 0.8, 0.9, 0.98, 1.13, and 1.2. Selected configurations were tested at sideslip angles from -10 deg to +10 deg. For all configurations involving the orbit, wing bending and torsion were measured on the right wing. Inboard elevon setting of 0 deg, +4 deg and +8 deg and outboard settings of 0 deg, +4 deg and +8 deg were tested. Author

N75-23667*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
EVALUATION OF DISPERSION STRENGTHENED NICKEL-BASE ALLOY HEAT SHIELDS FOR SPACE SHUTTLE APPLICATION Summary Report, 15 May 1973 - 31 May 1975
R. Johnson, Jr. and D. H. Killpatrick May 1975 126 p refs
(Contract NAS1-11654)
(NASA-CR-132615; MDC-G5241) Avail: NTIS HC $5.75 CSCL 13A

The design, fabrication, and testing of a full-size, full-scale TD Ni-20Cr heat shield test array in simulated mission environments is described along with the design and fabrication of two additional full-size, full-scale test arrays to be tested in flowing gas test facilities at the NASA Langley Research Center. Cost and reusability evaluations of TD Ni-20Cr heat shield systems are presented, and weight estimates of a TD Ni-20Cr heat shield system for use on a shuttle orbiter vehicle are made. Safe-line expectancy of a TD Ni-20Cr heat shield system is assessed. Non-destructive test techniques are evaluated to determine their effectiveness in quality assurance checks of TD Ni-20Cr components such as heat shields, heat shield supports, close-out panels, formed cover strips, and edge seals. Results of tests on a braze reinforced full-scale, subsize panel are included. Results show only minor structural degradation in the main TD Ni-20Cr heat shields of the test array during simulated mission test cycles. Author

N75-23668*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF ELECTRON IRRADIATION IN VACUUM ON FEP-A SILICON SOLAR CELL COVERS
Stanley J. Marsik and Jacob D. Broder 1975 10 p refs Presented at the 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71713; E-8333) Avail: NTIS HC $3.25 CSCL 18H

Fluorinated ethylene-propylene-A (FEP-A) covers on silicon solar cells were irradiated with 1-MeV electrons, in vacuum, to an accumulated fluence equivalent to approximately 28 years in synchronous orbit. The effect of irradiation on the light transmittance of FEP-A was checked by measuring the short-circuit current of the cells after each dose increment. The results indicate

no apparent overall loss in transmission due to irradiation of FEP-A. Filter wheel measurements revealed some darkening of the FEP-A at the blue end of the spectrum. Although no delamination from the cell surface was observed while in vacuum, embrittlement of FEP-A occurred at the accumulated dose.
Author

N75-23669*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CENTAUR STANDARD SHROUD (CSS) STATIC LIMIT LOAD STRUCTURAL TESTS
C. Eastwood Apr. 1975 232 p refs
(NASA-TM-X-71727) Avail: NTIS HC $7.50 CSCL 22B

The structural capabilities of the jettisonable metal shroud were tested and the interaction of the shroud with the Centaur stage was evaluated. A flight-configured shroud and the assemblies of the associated Centaur stage were tested for applied axial and shear loads to flight limit values. The tests included various thermal, pressure, and load conditions to verify localized strength capabilities, to evaluate subsystem performance, and to determine the aging effect on insulation system properties. The tests series verified the strength capabilities of the shroud and of all associated flight assembles. Shroud deflections were shown to remain within allowable limits so long as load sharing members were connected between the shroud and the Centaur stage. Author

N75-23670# European Space Research and Technology Center, Noordwijk (Netherlands).
DYNAMIC ANALYSIS OF A SATELLITE WITH DEFORMABLE PARTS
Daniel H. L. Poelaert Paris ESRO Oct. 1974 50 p refs
(ESRO-SR-22-ESTEC) Avail: NTIS HC $3.75

The general Lagrange formulation is used in setting up the equations of hybrid (continuous-discrete) dynamical systems and applied to the dynamic analysis of a spinning satellite having two long flexible cable booms. Normal modes are derived to expand the internal displacement field of the system. The finite inertia of the main body is taken into account, leading to a physical understanding of the modal truncation. In the resulting model, the flexible modes can be represented by a set of decoupled second-order oscillators governed by the external excitation. The numerical procedure used and the results concerning the dynamic model of the GEOS satellite are given. The latter is presented in a form which should prove useful in a controller design as well as in the system simulation and estimation. ESRO

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N75-23671*# Kanner (Leo) Associates, Redwood City, Calif.
PRESSURES AND ELEVATIONS FROM CO2 BAND INTENSITIES BASED ON MEASUREMENTS MADE ON BOARD THE MARS-5 AUTOMATIC INTERPLANETARY STATION (PRELIMINARY RESULTS)
L. V. Ksanfomaliti, B. S. Kunashev, and V. I. Moroz Washington NASA May 1975 8 p refs Transl. into ENGLISH from Kosm. Issled., v. 13, no. 1, Jan.-Feb. 1975 p 84-88
(Contract NASw-2481)
(NASA-TT-F-16346) Avail: NTIS HC $3.25 CSCL 22B

The optical circuitry of the Mars-5 CO2 altimeter is presented and its operation is described. It is based on the fact that intensity of the molecular absorption bands depends on the quantity of absorbing matter along the light beam path. The instrument employs seven interchangeable interference filters and seven independent amplification channels for each filter output. An automatic gain regulating system is provided to ensure normal operation of the photometer. Pressure and elevation curve distributions are presented and are shown to coincide in basic details. Author

N75-23672*# Raytheon Co., Sudbury, Mass. Equipment Development Lab.
SPACE VEHICLE VITERBI DECODER Final Report
16 Apr. 1975 64 p
(Contract NAS9-13923)
(NASA-CR-141787; ER75-4176) Avail: NTIS HC $4.25 CSCL 09F

The design and fabrication of an extremely low-power, constraint-length 7, rate 1/3 Viterbi decoder brassboard capable of operating at information rates of up to 100 kb/s is presented. The brassboard is partitioned to facilitate a later transition to an LSI version requiring even less power. The effect of soft-decision thresholds, path memory lengths, and output selection algorithms on the bit error rate is evaluated. A branch synchronization algorithm is compared with a more conventional approach. The implementation of the decoder and its test set (including all-digital noise source) are described along with the results of various system tests and evaluations. Results and recommendations are presented. Author

N75-23673*# Bendix Corp., Teterboro, N.J. Guidance Systems Div.
ATM CMG/EPEA Final Summary Report
R. Abramowitz, J. Kovek, W. Teimer, and S. P. Haddad 1975 188 p refs
(Contract NAS8-20661)
(NASA-CR-120760) Avail: NTIS HC $7.00 CSCL 17G

The Apollo Telescope mount double gimballed control moment gyro ATM CMG is described. Photographs of the CMG and its subassemblies are presented along with a functional block diagram of the CMG subsystem. Analog processing electronics for ATM vehicle pointing control and ATM experiment package pointing control are also described. J.M.S.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-23674 Illinois Univ., Urbana.
ON THE ELECTRIC PROPULSION/MISSION SYSTEM: ENERGY, CONSTRAINTS, AND CHARACTERISTIC SURFACES Ph.D. Thesis
Kenneth Lee Atkins 1974 106 p
Avail: Univ. Microfilms Order No. 75-11527

The fundamental equations of low-thrust space flight are reviewed in the context of optimization techniques to determine applicable mission constraints and value ranges for parameters of interest. The equations are then examined in a framework of total system energy to emphasize the nonconservative nature of the mission/hardware system. This is shown to be in direct contrast with the conservative nature of ballistic heliocentric orbits. Quantitative studies were made two specific missions, completely dissimilar in nature, to demonstrate the system's characteristic features. The emphasis is placed on overall system effects through several progressive analysis steps. A qualitative study of system variables and constraints is performed. It is shown that for the electric propulsion/mission system there exists an energy surface representing the mission and its constraints.
Dissert. Abstr.

N75-23675 Alabama Univ., University.
ANALYSIS OF PROBLEMS IN ROCKET BASE HEAT TRANSFER DURING THE ASPIRATION PHASE Ph.D. Thesis
William Benton Mcanelly 1974 190 p
Avail: Univ. Microfilms Order No. 75-9920

The heat transfer and fluid flow field in the base region of a multi-engine rocket during the aspiration phase is analyzed. An engineering model of the fluid flow and heat transfer during the aspiration phase is proposed and justified. The instrumentation used to measure the inflight thermal-fluid parameters and the measured results are reviewed and analyzed. It is concluded

that most inflight measurement inconsistencies and previously inexplicable results can be attributed to instrument errors. Measurement inconsistencies and previously inexplicable results can be attributed to instrument errors. Measurement inconsistencies are explained and corrected. The resulting dimensionless heat transfer is correlated and compared to results obtained from the proposed engineering model. Comparisons between the model and flight data are shown to be favorable. An urgent need for research and development of accurate instruments and/or techniques for measuring gas temperatures and heating rates in a coupled radiant and convective environment is identified. Dissert. Abstr.

N75-23676*# IIT Research Inst., Chicago, Ill.
ATTITUDE CONTROL PROPULSION COMPONENTS, VOLUME 1
Nov. 1974 309 p Prepared for JPL
(Contracts NAS7-100; JPL-953830)
(NASA-CR-136741-Vol-1) Avail: NTIS HC $9.25 CSCL 22B

Effort was made to include as much engineering information on each component as possible, consistent with usefulness and catalog size limitations. The contents of this catalog contain components which were qualified for use with spacecraft monopropellant hydrazine and inert gas attitude control systems. Thrust ranges up to 44.5 N (10.0 lbf) for hydrazine and inert gas sytems were considered. Additionally, some components qualified for uses other than spacecraft attitude control are included because they are suitable for use in attitude controls systems. Author

N75-23677*# IIT Research Inst., Chicago, Ill.
ATTITUDE CONTROL PROPULSION COMPONENTS, VOLUME 2
Nov. 1974 288 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953830)
(NASA-CR-136741-Vol-2) Avail: NTIS HC $8.75 CSCL 22B

Attitude control propulsion components are described, including hydrazine thrusters, hydrazine thruster and cold gas jet valves, and pressure and temperature transducers. Component-ordered data are presented in tabular form; the manufacturer and specific space program are included. J.A.M.

N75-23678*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRIC POWER FOR SPACE SATELLITES
Charles M. MacKenzie 4 Apr. 1974 32 p Presented at the Solar Energy Lecture 4, Washington, D. C., Mar. - May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
(NASA-TM-X-66808) Avail: NTIS HC $3.75 CSCL 21C

The development of electric power systems for satellites is discussed as an evolutionary process requiring the integration of power generation, power storage, and power control and distribution. The growth of space electric power systems is traced. The capabilities and limitations of the various elements (i.e. silicon solar cells) are discussed together with their impact on future technological growth. Author

N75-23679*# TRW Systems Group, Redondo Beach, Calif. Electric Propulsion Dept.
POWER PROCESSOR FOR A 30cm ION THRUSTER Final Report, Nov. 1972 - May 1974
J. J. Biess and L. Y. Inouye Oct. 1974 198 p
(Contract NAS3-14383)
(NASA-CR-134785; TRW-20384-6002-RU-01) Avail: NTIS HC $7.00 CSCL 21C

A thermal vacuum power processor for the NASA Lewis 30cm Mercury Ion Engine was designed, fabricated and tested to determine compliance with electrical specifications. The power processor breadboard used the silicon controlled rectifier (SCR) series resonant inverter as the basic power stage to process all the power to an ion engine. The power processor includes a digital interface unit to process all input commands and internal telemetry signals so that operation is compatible with a central computer system. The breadboard was tested in a thermal vacuum environment. Integration tests were performed with the ion engine and demonstrate operational compatibility and reliable operation without any component failures. Electromagnetic interference data were also recorded on the design to provide information on the interaction with total spacecraft. Author

N75-23680*# Rocketdyne, Canoga Park, Calif.
HYDRAZINE GAS GENERATOR PROGRAM Final Report
L. Kusak and R. Marcy Mar. 1975 152 p refs
(Contract NAS9-13003)
(NASA-CR-141795; R-9690) Avail: NTIS HC $6.25 CSCL 21E

The design and fabrication of a flight gas generator for the space shuttle were investigated. Critical performance parameters and stability criteria were evaluated as well as a scaling laws that could be applied in designing the flight gas generator. A test program to provide the necessary design information was included. A structural design, including thermal and stress analysis, and two gas generators were fabricated based on the results. Conclusions are presented. Author

N75-23681*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUMMARY OF HIGH EFFICIENCY SILICON SOLAR CELL MEETING HELD AT NASA-LEWIS
Daniel T. Bernatowicz 1975 4 p Presented at the 11th Photovoltaic Specialists Conf., Phoenix, 6-8 May 1975; Sponsored by the Inst. of Elec. and Electron. Engr.
(NASA-TM-X-71729; E-8353) Avail: NTIS HC $3.25 CSCL 10B

Attempts made to raise the efficiency of solar cells for space use are reported. The Helios, violet, and non-reflective cells were studied and it was concluded that the maximum practical efficiency of silicon solar cells is between 17 and 20%. Author

N75-23682*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NATURAL ENVIRONMENT DESIGN CRITERIA FOR THE SOLAR ELECTRIC PROPULSION STAGE (SEPS)
Jerry J. Wright 20 May 1975 16 p refs
(NASA-TM-X-64929) Avail: NTIS HC $3.25 CSCL 21C

The natural environment design criteria are given for six different solar electric propulsion stage missions. These environment data include the neutral atmosphere; ionosphere, trapped radiation; free-space radiation environment; and meteoroid, asteroid, and comet environments. The electromagnetic radiation environment (direct, reflected, or scattered) at the planets and interplanetary regions is also included. Author

N75-23683*# Little (Arthur D.), Inc., Cambridge, Mass.
FEASIBILITY STUDY OF A SATELLITE SOLAR POWER STATION Final Report
Peter E. Glaser, Owen E. Maynard (Raytheon Co., Sudbury, Mass.), John J. R. Mackovciak (Grumman Aerospace Corp., Bethpage, Mass.), and Eugene I. Ralph (Spectrolab, Inc., Sylmar, Calif.)
Washington NASA Feb. 1974 199 p refs
(Contract NAS3-16804)
(NASA-CR-2357; ADL-C-74830) Avail: NTIS HC $7.00 CSCL 10B

A feasibility study of a satellite solar power station (SSPS) was conducted to: (1) explore how an SSPS could be flown and controlled in orbit; (2) determine the techniques needed to avoid radio frequency interference (RFI); and (3) determine the key environmental, technological, and economic issues involved. Structural and dynamic analyses of the SSPS structure were performed, and deflections and internal member loads were determined. Desirable material characteristics were assessed and technology developments identified. Flight control performance of the SSPS baseline design was evaluated and parametric sizing studies were performed. The study of RFI avoidance techniques covered (1) optimization of the microwave transmission system; (2) device design and expected RFI; and (3) SSPS RFI effects. The identification of key issues involved (1) microwave generation, transmissions, and rectification and solar energy conversion; (2) environmental-ecological impact and biological effects; and (3) economic issues, i.e., costs and benefits associated with the SSPS. The feasibility of the SSPS based on the parameters of the study was established. Author

N75-23684*# Martin Marietta Corp., Denver, Colo.
ACQUISITION SYSTEM ENVIRONMENTAL EFFECTS STUDY Final Report

May 1975 118 p refs
(Contract NAS8-30592)
(NASA-CR-120768; MCR-75-21) Avail: NTIS HC $5.25 CSCL 21H

The effects of vibration, warm gas exposure, and feed system startup/shutdown fluid dynamics on capillary-screen propellant retention capabilities are quantified. The existing technology is extended to the point where quantitative conlusions in terms of design criteria may be drawn. Author

N75-23685*# General Dynamics/Convair, San Diego, Calif.
SPACE LOX VENT SYSTEM Final Report
R. C. Erickson 30 Apr. 1975 133 p refs
(Contract NAS8-26972)
(NASA-CR-120769; CASD-NAS-75-021) Avail: NTIS HC $5.75 CSCL 21H

This is the final report summarizing the work completed under contract NAS8-26972. Concept selection, design, fabricating and testing of a prototype compact heat exchanger thermodynamic vent system are discussed. The system is designed to operate in a 2.7m (9 foot) spherical liquid oxygen tank with a heating rate of 32.2 - 35.2 watts (110-120 Btu/hr) and to control pressure to 310 + or - 13.8 kN/sq m (45 + or - 2.0 psia.) the design mission is of 2,590 ks (30 days) duration on board a space shuttle orbiter. Author

N75-23686# Naval Ship Research and Development Center, Bethesda, Md.
HYDRODYNAMIC STABILITY EVALUATION OF AN 0.088-SCALE SOLID ROCKET BOOSTER MODEL
John F. Campbell Nov. 1974 45 p refs
(AD-A007477; NSRDC-4335) Avail: NTIS CSCL 21/8

The free-floating and towing stability of a 0.088-scale Solid Rocket Booster model was experimentally investigated to determine the feasibility of towing a full-scale rocket booster at sea. Equilibrium attitude and towing behavior were examined at various percentages of internal water-fill, sea states, sea directions, towpoint attachments, and towline lengths. Towline tensions were measured, and pitching, rolling, and yawing motions were monitored. Predicted, full-scale values of average and peak towline tension are presented graphically. GRA

N75-23687# Ultrasystems, Inc., Irvine, Calif.
NONEQUILIBRIUM RADIATION MODEL FOR EXHAUST PLUMES Final Report, Nov. 1972 - May 1974
Gary R. Nickerson Mar. 1975 169 p refs
(Contract F04611-73-C-0032)
(AD-A007795; SN-8225/FR; AFRPL-TR-74-74) Avail: NTIS CSCL 07/4

The objective of this work effort has been to develop a computer code to model nonequilibrium infrared core radiation from rocket plumes. Radiation sources caused by atmospheric interaction are not considered in the model. Because of the number of chemical species, vibrational states, and reaction paths involved, a sophisticated kinetic model is required in any attempt to explain experimental observations of infrared radiation when nonequilibrium processes are important. Such a model is also needed to predict conditions where more conventional thermodynamically based models might be properly applied. In the present study the radiating medium is assumed to be optically thin. Included are a technical discussion of the computer model and a discussion of the method of approach used in implementing the computer model, as well as a step by step description of the computer model. The chemical kinetics model employed in the calculations is described. A complete description of vibrational energy transfer processes, together with a literature survey, is presented. The thermodynamic model which has been developed to allow treatment of the vibrational states of molecules, a discussion of the gas dynamics model, a discussion of the radiation model, and results and conclusions are presented. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-23688*+ National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BIBLIOGRAPHY ON CONTAMINANTS AND SOLUBILITY OF ORGANIC COMPOUNDS IN OXYGEN
Paul M. Ordin, comp. [1975] 190 p refs
(NASA-TM-X-71700; E-8308) Avail: NTIS HC $7.00 CSCL 07C

A compilation of a number of document citations is presented which contains information on contaminants in oxygen. Topics covered include contaminants and solubility of organic compounds in oxygen, reaction characteristics of organic compounds with oxygen, and sampling and detection limits of impurities. Each citation in the data bank contains many items of information about the document. Some of the items are title, author, abstract, corporate source, description of figures pertinent to hazards or safety, key references, and descriptors (keywords) by which the document can be retrieved. Each citation includes an evaluation of the technical contents as to being good/excellent, acceptable, or poor. The descriptors used to define the contents of the documents and subsequently used in the computerized search operations were developed for the cryogenic fluid safety by experts in the cryogenics field. Author

N75-23689# Princeton Univ., N.J. Dept. of Chemical Engineering.
THE PREPARATION AND PHYSICAL PROPERTIES OF POLYESTER-POLY (METHYL METHACRYLATES) TRIBLOCK COPOLYMERS Technical Report, 1 Jan. - 1 Mar. 1975
G. L. Wilkes and J. H. Grezlak Mar. 1975 46 p refs
(Contract N00014-67-A-0151-0011; NR Proj. 056-377)
(AD-A007347; TR-138) Avail: NTIS CSCL 07/3

Block copolymers having the basic structure of PMMA-PE-PMMA were prepared by the reaction of diisocyanate-terminated polyesters with hydroxyl-terminated poly(methyl methacrylate). The molecular weights of these copolymers varied from 7500 to 47,000. The formation of block copolymers by this method was confirmed by infrared and molecular weight analyses as well as by the physical behavior of these materials. Block copolymers of molecular weight less than 21,000 were extremely brittle in nature. The stronger copolymers of molecular weight greater than 29,000 were examined as to their dynamic modulus and stress-strain behavior. This included the effect of added homopolymer on the stress-strain behavior of such materials. To better understand their physical properties, the micelle theory of Inoue et. al. was applied to these copolymers to help elucidate their morphologies. Author

N75-23690# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
SYSTEM EVALUATION OF SOLID CHEMICAL OXYGEN GENERATORS Final Report, 21 Aug. 1972 - 30 Sep. 1974
Edward B. Thompson, Jr. Mar. 1975 28 p refs
(AF Proj. 6146)
(AD-A007691; AFFDL-TR-75-19) Avail: NTIS CSCL 07/1

Aircraft system planners are turning increasingly to the possibility of replacing LOX with alternative types of breathable oxygen supply systems that are less dependent on re-supply and maintenance. Solid chemical (chlorate candle) oxygen generation is a candidate among the alternative systems being considered. This effort concerned the test and performance evaluation of two basic types of chlorate candle oxygen generators while operating in a laboratory system console. The two candle formulations were compared for oxygen producing capacity, flowrate, and ignitability. System data on candle generator temperature and accumulator pressure was also recorded. The results of the effort established that sodium chlorate candle ignition and performance were more consistent and superior to lithium perchlorate candles. GRA

N75-23691# Indian National Scientific Documentation Centre, New Delhi.
CHEMISTRY OF ORGANIC SULFUR COMPOUNDS

CONTAINED IN PETROLEUMS AND PETROLEUM PRODUCTS, VOLUME 7
1974 536 p refs Transl. into ENGLISH of the book "Khimiya seraorganicheskikh soedinenii soderzhashchikhsya v neftyakh i nefteprodukakh, tom 7" Moscow, 1964 529 p Conf. held in Ufa, USSR, 12-16 Feb. 1963 Sponsored in part with the Bureau of Mines, Washington, D.C.
(Contract NSF C-466)
(TT-70-57759) Avail: NTIS HC $12.50 CSCL 07C

Papers given at a conference on organic sulfur compounds are presented. Topics discussed include development of processes for the preparation of organic sulfur compounds, the synthesis and study of the properties, reactivities, and applications of organic sulfur compounds, the composition of organic sulfur compounds contained in petroleums and petroleum products, methods for their removal and isolation, methods for their removal and isolation, methods for the analysis and determination of structure of the organic sulfur compounds, and thermocatalytic conversions. M.J.S.

N75-23692# Texas Technological Univ., Lubbock. Water Resources Center.
CONVERSION OF CATTLE FEEDLOT WASTES TO AMMONIA SYNTHESIS GAS Final Report
James E. Halligan, Karl L. Herzog, Harry W. Parker, and Robert M. Sweazy Dec. 1974 55 p refs
(Contract EPA-R-801065)
(PB-239668/7; EPA-660/2-74-090) Avail: NTIS MF $2.25; SOD HC $4.25 CSCL 07A

The potential of a process to convert cattle feedlot manure to anhydrous ammonia is considered. Due to the fact that ammonia is currently produced on a large scale using natural gas and air, only the processing associated with a reactor system to convert the manure into a suitable synthesis gas was considered in this study. The synthesis gas can be further processed to anhydrous ammonia using existing technology. GRA

N75-23693# National Environmental Research Center, Cincinnati, Ohio. Radiochemistry and Nuclear Engineering Research Facility.
ANNUAL CONFERENCE ON BIOASSAY (20TH), ENVIRONMENTAL, AND ANALYTICAL CHEMISTRY
Jan. 1975 52 p refs Conf. held at Cincinnati, 24-25 Sep. 1974
(PB-238772/8; EPA-RNEF-75/1) Avail: NTIS HC $4.25 CSCL 07E

Abstracts are presented from the 20th Annual Conference on Bioassay, Environmental, and Analytical Chemistry whose subject matter included measurement, determination, and analysis for radioactivity in the environment, animals, and man. The presentations concerned techniques, methods, instruments, etc., for determining a variety of radioactive substances (e.g., iodine, uranium, americium) in a variety of situations (reactor stack gases, soil, body tissue, occupational working areas). GRA

24 COMPOSITE MATERIALS

Includes laminates.

N75-23694 Duke Univ., Durham, N.C.
PLASTICITY THEORY OF FIBER-REINFORCED METAL MATRIX COMPOSITES Ph.D. Thesis
Muppavarapu Sethu Madhava Rao 1974 255 p
Avail: Univ. Microfilms Order No. 75-10719

The plastic deformation of the fiber-reinforced metal matrix composites was studied. The composites were made of isotropic, linearly elastic fibers, and elastic-plastic, non-hardening matrix of Mises type. A plasticity theory is formulated to predict analytically the macroscopic and microscopic responses of unidirectional fiber-reinforced metal matrix composites, loaded by axisymmetric composites stress states. It is shown that the unidirectional composites experience kinematic hardening when loaded by axisymmetric composite stresses. The results obtained by hardening and flow rules are compared with exact plasticity solutions based on the finite element method. An approximate method for the determination of microstresses in the unidirectional composites under axisymmetric loading is given. The initial yielding of the multilayered composites made of unidirectional fibrous composite layers is considered. Dissert. Abstr.

N75-23695 Centre d'Etudes et Recherches des Charbonnages de France, Creil.
STUDY OF FIBER REINFORCEMENT OF THERMOPLASTIC POLYMERS Final Report [ETUDE DU RENFORCEMENT DES POLYMERES THERMOPLASTIQUES PAR DES FIBRES]
A. Boyer, J. C. Delaby, and R. Loedel Feb. 1974 43 p refs In FRENCH
(Contract DGRST-72-7-0141)
Avail: Issuing Activity

Fiber-polymer adhesion is studied in order to improve the quality of reinforced thermoplastics. Two methods for measuring the adhesion were developed: formation of a polymer film perpendicular to the unitary glass fiber and measurement of the adhesion factor of the fiber during traction; and extraction of a metallic wire from a polymer block in which the wire was immersed by moulding. Various treatments which may influence the adhesion were tested. It is shown that there are pronounced differences between the fibers presently recommended for thermoplastics reinforcement. ESRO

N75-23696*# Scientific Translation Service, Santa Barbara, Calif.
PREPARATION AND PROPERTIES OF TUNGSTEN-WIRE REINFORCED NiCr 80-20
H. W. Gruenling Washington NASA May 1975 17 p refs Transl. into ENGLISH from Deut. Ges. Metallk. (Oberussel), 1972 p 138-152 Presented at the 2d Composite Matter. Meeting, Konstanz, West Ger., 15-16 Mar. 1972
(Contract NASw-2483)
(NASA-TT-F-16275) Avail: NTIS HC $3.25 CSCL 11F

Tungsten wire reinforced nickel-chromium alloys with widely ideal hexagonal fiber array can easily be fabricated by using liquid infiltration methods. But only for some combinations of fiber content and fiber diameter can the infiltration conditions be chosen properly to avoid fiber damage by interaction with the matrix melt. With smaller fiber diameters and/or higher fiber content fiber damage occurs even by using W-2% ThO2-wires to such an extent that composite strength is only about half of the rule-of-mixture strength. An additional deformation process widely removes fiber damage. Strength values are found which nearly reach theoretical values, related to fiber values are found which nearly reach theoretical values, related to fiber diameters after deformation. With fiber contents between 30 and 90 vol.-% they range between 1200 and 2000 N/sq mm. The elongation of such composites was found between 2 and 13%. Author

N75-23697*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANELASTIC DEFORMATION OF BORON FIBERS
James A. DiCarlo 3 Apr. 1975 16 p refs Presented at the Am. Phys. Soc. Meeting, Denver, Colo., 31 Mar. - 3 Apr. 1975 (NASA-TM-X-71710; E-8326) Avail: NTIS HC $3.25 CSCL 11D

The flexural deformation behavior of vapor-deposited boron fibers was examined from 100 to 1100 K by stress-relaxation and internal friction techniques. Only strong thermally-activated anelasticity was observed with no evidence of plasticity up to surface strains of 0.006. The parameters governing the relaxation processes within the anelastic spectra of as-received and annealed fibers were determined. These parameters were correlated with X-ray structure studies to develop preliminary models for the sources of boron's anelasticity. The large relaxation strengths of the dominant Ia processes coupled with their relaxation times and energies suggest a sliding mechanism between certain basic structural subunits common to both the beta-rhombohedral and vapor-deposited boron structures. Author

N75-23698# Advisory Group for Aerospace Research and Development, Paris (France).
SPECIALISTS MEETING ON FAILURE MODES OF COMPOSITE MATERIALS WITH ORGANIC MATRICES AND THEIR CONSEQUENCES ON DESIGN
Mar. 1975 162 p refs In ENGLISH; partly in FRENCH Presented

at 39th Meeting of the Struct. and Mater. Panel, Munich, 13-19 Oct. 1974
(AGARD-CP-163) Avail: NTIS HC $6.25

The aerospace industry's constant search for structural materials which offer advantages of high strength, low density, high fatigue endurance and adaptability to the intended function, is reported. The understanding of the failure mechanism of an isotropic material like a metal, where fracture is essentially a single parameter problem, is still a difficult subject, but the quantitative analysis of the failure of anisotropic composites, where many parameters are involved, becomes infinitely more complex. This conference proceedings contains the text of twelve papers given at the AGARD Specialists Meeting organized to consider the problem. The latest developments in the study of failure of composite materials is contained in these papers. Included are analyses of the failure modes of these materials and presentation of methods to predict such failures. Included also are methodology and equipment for studying failures of composite materials, methods of testing composites to detect incipient failures, and suggestions of design criteria for the use of composites in order to achieve a safe-life design procedure for structures and components constructed of fiber-reinforced composite materials. For individual titles, see N75-23699 through N75-23710.

N75-23699 Nottingham Univ. (England). Dept. of Mechanical Engineering.
PREDICTION OF STATIC AND FATIGUE DAMAGE AND CRACK PROPAGATION IN COMPOSITE MATERIALS
M. J. Owen and P. T. Bishop *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 12 p refs (For availability see N75-23698 15-24)

Finite element stress analysis was used to predict the stresses around a hole in finite width plates fabricated from various glass-fiber reinforced plastics. The results were used to predict the initiation of damage at holes under static and fatigue loading and showed that they act as almost fully effective stress concentrators. This approach leaves a number of important problems unsolved. Firstly, for some materials there appears to be a substantial adverse size effect. Secondly, in the life range from 1,000 to 1 million cycles the fatigue curve is nearly straight and attempts to extrapolate to long lives lead to the prediction of zero safe stress amplitude at finite lives. Thirdly, the onset of transverse fiber damage is often an unacceptably severe criterion. Preliminary work on two of the GRP materials has shown that size effects can be represented through a fracture toughness approach and the problems of extrapolation to long lives and damage tolerance can be dealt with by means of a crack growth law (1) based on stress intensity factor range. Author

N75-23700 Washington Univ., St. Louis, Mo.
FAILURE CRITERIA TO FRACTURE MODE ANALYSIS OF COMPOSITE LAMINATES
Edward M. Wu *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 11 p refs (For availability see N75-23698 15-24)
(Contract F33615-72-C-1514; Grant AF-AFOSR-74-2687)

Quantitative understanding of the parameters which control composite fracture is imperative to the implementation of fail safe design and inspection of critical load bearing structures. For isotropic materials, fracture is essentially controlled by a single parameter, e.g., the fracture toughness or the stress-intensity factor. This one dimensional nature lends itself to experimental quantification. However, for anisotropic composites there are at least seven primary controlling parameters: (1) crack length; (2) crack orientation with respect to material axis of anisotropy; (3) nature of applied combined stresses; (4) lamination geometry; (5) deformational and strength responses of the constituent lamina; (6) three kinematically admissible modes of crack extension and (7) crack trajectory. Because of this large number of parameters, experimental quantification by systematic permutation of the parameters must be realistically viewed as intractable. This paper presents an analytical method of reducing these parameters from seven to two and furnishes experimental observations which lend support to the theoretical model. Author

N75-23701 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
AN EXPERIMENTAL STUDY TO DETERMINE FAILURE ENVELOPE OF COMPOSITE MATERIALS WITH TUBULAR SPECIMENS UNDER COMBINED LOADS AND COMPARISON BETWEEN SEVERAL CLASSICAL CRITERIA
U. Huetter, H. Schelling, and H. Krauss *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 11 p refs (For availability see N75-23698 15-24)

For conventional isotropic materials failure hypotheses are known, which yield comparative failure stresses for combined load conditions. Such failure hypotheses may be described in three-dimensional failure envelopes, both, experimentally and analytically. For fiber-reinforced composites, with the defined layerwise orthotropy of elastical and mechanical properties, a number of analytical approaches to failure hypotheses are known. In order to determine these failure envelopes of fiber reinforced materials experimentally, a testing equipment was set up. Using tubular specimens it was possible to find out the critical failure limits under general in-plane stress. This report describes the installations required, the testing schedule, manufacturing and structural design of the specimens as well as the results found by extensive series of experiments. These results are compared with theoretical values of failure hypotheses available. Author

N75-23702 Institut Superieur des Materiaux et de la Construction Mecanique, Saint-Ouen (France). Lab. de Rheologie.
INELASTIC BEHAVIOUR OF COMPOSITES (PLASTIC PREDICTION BY LIMIT ANALYSIS) [ETUDES CRITIQUES DE DIVERS CRITERES DE PLASTICITE APPLICABLES AUX MATERIAUX COMPOSITES]
D. Lenizerhy and T. Vihn *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 20 p refs In FRENCH (For availability see N75-23698 15-24)

The use of mathematical theories to study plastic properties, limit criteria, and anistropic yield in metal composites was examined. Transl. by E.H.W.

N75-23703 Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
PRACTICAL FINITE ELEMENT METHOD OF FAILURE PREDICTION FOR COMPOSITE MATERIAL STRUCTURES
E. Henze and S. Roth *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 11 p refs (For availability see N75-23698 15-24)

A dimensioning procedure for anisotropic structures with the same resources already used to calculate and measure isotropic structures is examined. The available means of calculation and measurements are the finite element method and the strain gage technique. The necessary input data for the finite element method are: the elastic constants of the unidirectional lamina, the fiber orientation to a basic system and the contents of the different layers, characterized by the elastic constants and fiber angle, in the whole laminate. The output of the used finite element program are the stresses in each lamina of the whole laminate in any structure. These stresses are compared in a failure criteria with maximum stresses measured by simple test specimens. The comparison of calculation and tests of several different specimens, using the procedure described, are presented. Author

N75-23704 Centre d'Etude des Matieres Plastiques, Paris (France).
INFLUENCE OF FABRICATION PARAMETERS ON THE RUPTURE OF GLASS FIBER REINFORCED PLASTICS [INFLUENCE DES PARAMETRES DE FABRICATION SUR LA RUPTURE DES PLASTIQUES REINFORCES PAR DES FIBRES DE VERRE]
J. Pabiot *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 11 p refs In FRENCH (For availability see N75-23698 15-24)

A qualitative and quantative analysis was made of the marcoscopic rupture mechanism in glass fiber epoxy composites. Measurements were made of rupture characteristics under tensile

and bending stress in the orthotropic direction.
Transl. by E.H.W.

N75-23705 Technische Univ., Berlin (West Germany).
STRESS AND STRENGTH ANALYSIS OF REINFORCED PLASTIC WITH HOLES. CONSEQUENCES ON DESIGN
J. Wiedemann, H. Griese, and M. Glahn *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 11 p refs (For availability see N75-23698 15-24)

Composites with cutouts strain distributions in biaxial reinforced specimens were measured and calculated according to the elastic theory. The tangential stress at the edge was compared with the orthotropic strength of the material. Thus failure position and ultimate load could be estimated. To improve strength, various possibilities are proposed: around holes, the woven reinforcement can be widened without cutting fibers, medium sized holes can be reinforced by patches, large cutouts should be shaped in a neutralizing way and stiffened by rovings. If patches are applied, failure occurs at the hole or in front of the patch or by delaminating. Patches with elliptical shape prove advantageous for unidirectional loading according to theoretical and empirical investigations. In case of biaxial loading, a round neutralizing patch can be recommended. With respect to this case, calculations were made for isotropic and orthotropic materials. Also shear stiffness and stress of the adhesive are considered. Author

N75-23706 Royal Aircraft Establishment, Farnborough (England). Strength and Fracture Section.
FRACTURE BEHAVIOUR AND RESIDUAL STRENGTH OF CARBON FIBRE COMPOSITES SUBJECTED TO IMPACT LOADS
G. Dorey *In* AGARD Specialists Meeting on Failure Models of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 12 p refs (For availability see N75-23698 15-24)

Carbon fiber reinforced plastic (CFRP) has properties such as high specific strength and stiffness which are attractive for aerospace applications. However, it can be susceptible to impact damage at relatively low incident energies. Brittle fibers in a brittle matrix can absorb appreciable amounts of energy only by fracture processes. This paper describes a variety of such fracture processes by which CFRP laminates can fail under impact conditions. Which failure mode occurs in a particular situation is discussed in terms of material properties, component geometry and the kind of loading. Of particular interest to the designer are residual strengths and stiffnesses after impact and typical cases are illustrated for CFRP laminates subjected to dropweight and ball gun impact; from subcritical energies up to complete penetration. Material modifications, aimed at minimizing certain types of impact damage are described and examples given, such as hybrid composites and modified fiber arrangements, which show promise of improved impact resistance. Author

N75-23707 IIT Research Inst., Chicago, Ill. Stress Analysis Section.
OPTICAL METHODS FOR TESTING COMPOSITE MATERIALS
I. M. Daniel *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 20 p refs (For availability see N75-23698 15-24)

Optical stress analysis techniques and their application to the study of deformation and fracture of composite materials are described and discussed. These include photoelastic coatings, moire grids, holographic interferometry, and liquid crystals. Photoelastic coatings are used to determine full-field surface strain distributions, strain concentrations around cracks and other discontinuities, and initiation, mode and propagation of fracture. Moire techniques yield full-field displacement and strain distributions. They have been applied to the detection of crack propagation and its associated failure modes, the determination of strain concentrations and the study of the interlaminar shear edge effect. The sensitivity of the method can be greatly enhanced by using fringe multiplication techniques. Holographic interferometry is most suitable for determining out-of-plane deformations. It is particularly useful in the study of flexure of plates, modes and amplitudes of vibration, and failure modes resulting in out-of-plane deformations, such as delaminations. The high sensitivity of liquid crystals to heat and their property of emitting visible radiation make them suitable for detecting local delaminations and fatigue fractures. All these techniques have different advantages and limitations. The selection of any one or more of these depends on each particular application. Author

N75-23708 Commissariat a l'Energie Atomique, Toulouse (France).
POSSIBLE UTILIZATION OF ELECTRON SCAN MICROSCOPE FOR THE STUDY OF COMPOSITE MATERIALS WITH ORGANIC MATRIX [POSSIBILITIES D'UTILISATION DU MICROSCOPE ELECTRONIQUE A BALAYGE POUR L'ETUDE DES MATERIAUX COMPOSITES A MATRICE ORGANIQUE]
J. Auvinet and J. Rouchon *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices an Their Consequences on Design Mar. 1975 5 p refs In FRENCH (For availability see N75-23698 15-24)

The use of a scanning electron microscope to study rupture in metal matrix composites was discussed. Particular attention was given to evaluating the quality of composite impregnation under vacuum and fiber-matrix interfaces. The possibility of qualitative examining fiber corrosion in aged composites was discussed along with surface damage. Transl. by E.H.W.

N75-23709 Messerschmitt-Boelkow G.m.b.H., Ottobrunn (West Germany).
DESIGN OF COMPOSITE STRUCTURE WITH RESPECT TO AVOID CRACK PROPAGATION
K. Brunsche *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 9 p ref (For availability see N75-23698 15-24)

Within the manifold of composite structures developed, rotary wings are the best known components. Several types of composite rotorblades have been developed, tested, and produced. The experience with fatigue testing many GFP, CFP and mixed modulus coupons and full scale blade sections is used to make some design recommendation how crack propagation might be avoided. Respect is given to both influence of fabrication and influence of environment. For some cases deformation limits up to which no damage propagation occurs are given. Author

N75-23710 McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
CONSIDERATION OF FAILURE MODES IN THE DESIGN OF COMPOSITE STRUCTURES
L. B. Greszczuk *In* AGARD Specialists Meeting on Failure Modes of Composite Mater. With Organic Matrices and Their Consequences on Design Mar. 1975 24 p refs (For availability see N75-23698 15-24)
(Contracts N00019-72-C-0221; N00019-73-C-0405)

Pertinent equations are presented for predicting, from the properties of constituents and composite microstructure, the strength of unidirectional composites subjected to tensile, compressive, and shear loading in the fiber and transverse directions, the latter being normal to the fiber axis. Influence of fiber and matrix properties, voids, and ineffective or unbonded fibers on the strength and failure modes of composites are discussed. Typical examples are given on the application of results to the design of composite laminates and structures including: sensitivity of properties of multilayer, multidirectional composites to the aforementioned failure modes; reshaping of cutout shapes in composite plates to minimize the dependance of the plate's strength on a given material strength parameter; use of hybrid multiphase composites to improve strength properties and performance; and use of composite-reinforced metals for buckling critical applications and others. Author

N75-23711# Aerojet Nuclear Co., Idaho Falls, Idaho.
THERMAL NEUTRON FILTER CADMIUM ELECTROPLATE PROPERTIES
J. M. Beeston Dec. 1974 34 p refs
(Contract AT(10-1)-1375)
(ANCR-1189) Avail: NTIS HC $3.75

Properties of thick cadmium electrodeposited on steel plate

and tubing are compared for three principal baths: a standard bath, an Owen's bath, and a sulfamate bath. Some baths produced a brittle plate, e.g., the standard bath, while the Owen's and sulfamate baths produced a ductile plate than can experience a strain of about 20% without cracking. The plate was heated to 400 F without roughening or blistering from release of absorbed gas. Properties investigated were the bend and tensile, X-ray diffraction, hydrogen and impurity content, and microstructure. Author (NSA)

N75-23712# Texas Univ., Austin. Materials Science Lab.
ELEVATED TEMPERATURE MORPHOLOGICAL STABILITY OF METAL MATRIX FIBER COMPOSITES Final Report
T. H. Courtney Jun. 1974 17 p refs Sponsored by ERDA (ORO-3947-11) Avail: NTIS HC $3.25

The elevated temperature use of metal matrix fiber composites is predicted on their microstructural stability in both static and cyclic high temperature environments. Some results of thermal stability studies are reported for the isothermal stability in the Al-Al3Ni eutectic. A direct measurement of the velocity of lamellar fault migration was performed on the Pb-Sn eutectic. An isothermal stability study of the Cu-Cr rod eutectic is made, and it is one of the few rod-like eutectics in which both the fiber and matrix are metallic in nature and in which the fiber is essentially circular and without facets, indicating an isotropic surface energy. Aspects of eutectic growth and mechanical behavior were studied. NSA

N75-23713# Hawker Siddeley Dynamics Ltd., Hatfield (England). Space Div.
THE USE OF CARBON FIBRE REINFORCED PLASTICS IN SATELLITE STRUCTURES. VOLUME 1: SUMMARY Final Report on Phase 2, Oct. 1973 - Dec. 1974
J. Dickinson, comp. Dec. 1974 14 p 2 Vol.
(Contract ESTEC-1735/72-PP)
(HSD-TP-7509-Vol-1-Summ; ESRO-CR(P)-597) Avail: NTIS HC $3.25

Applications of Carbon Fiber Reinforced Plastics (CFRP) in satellite structures are summarized. The following topics are discussed: manufacture and test of some typical satellite structure joints; effects of thermal cycling and shock on material properties; mechanical and thermal properties of CFRP as a function of temperature-design, manufacture, and test of a CFRP IME boom. Technical appendices for each topic are contained in Volume 2. ESRO

N75-23714# Naval Research Lab., Washington, D.C.
CHARACTERISTICS OF CRACK PROPAGATION AT THE INTERFACE BETWEEN TWO DISSIMILAR MEDIA, PHASE 1 Final Report
D. R. Mulville 26 Feb. 1975 60 p refs
(NRL Proj. F01-04; NRL Proj. F01-14)
(AD-A007293; NRL-7839) Avail: NTIS CSCL 11/6

Studies were conducted on specimens of epoxy plates bonded to aluminum plates. The effect of surface roughness of the aluminum on fracture toughness was measured for four different surface finishes. It was found that increased surface roughness resulted in greater fracture toughness. This may be explained by the observation that the interfacial cracks replicated the surface features of the aluminum. Microscopic studies of the failure surfaces indicate that crack propagation occurs in the epoxy near the interface, and that a residue of epoxy remains bonded to the aluminum. The magnitude of the residual stresses due to casting and curing of the epoxy was determined by photoelastic techniques. Methods were developed for analyzing the birefringent pattern in the epoxy to determine the magnitude of the elastic residual stress and the frozen stress. It was found that residual stresses can contribute 15% to 20% of the strain required for crack initiation at the interface. GRA

N75-23715# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
MECHANICAL PROPERTIES OF ALUMINUM ALLOY-GRAPHITE FIBER COMPOSITES Interim Report
Maurice F. Amateau, William C. Harrigan, Jr., and E. George Kendall 21 Feb. 1975 32 p
(Contract F04701-74-C-0075)
(AD-A007779; TR-0075(9250-03)-3; SAMSO-TR-75-55) Avail: NTIS CSCL 11/4

The report discusses progress made on optimizing the mechanical properties of aluminum-graphite composites consolidated by liquid-phase hot pressing. Various matrix alloys, fabrication parameters, fiber fractions, and lay-up geometries are considered. The properties investigated include: tensile, compressive, and flexure strength, modulus, and fatigue. GRA

N75-23716# Materials Sciences Corp., Blue Bell, Pa.
COMBINED STRESS EFFECTS UPON FAILURE OF FIBER COMPOSITES Final Report, Jul. 1973 - Apr. 1974
Philip V. McLaughlin, Jr. and B. Walter Rosen Apr. 1974 90 p refs
(Contract N62269-73-C-0800)
(AD-A007352; TFR/7404/1112) Avail: NTIS CSCL 11/4

The cumulative weakening/axial shear crack model for axial tensile and shear failure of unidirectional fiber composite layers is extended to general plane stress states for materials having one (boron/epoxy) and many (graphite/epoxy) fibers through the thickness of a layer. The resulting failure surface is concave due to unstable shear crack propagation, and results in considerably different failure predictions from the usual maximum stress, maximum strain, or quadratic interaction criteria. Application of this heterogeneous failure criterion is made to failure analysis of laminates using linear and nonlinear laminate analysis techniques. An experimental program to test the heterogeneous unidirectional lamina failure theory is proposed. GRA

N75-23717# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
MATERIAL CHARACTERIZATION OF THE FRACTURE OF FILAMENT, REINFORCED COMPOSITES Final Report
G. C. Sih and E. P. Chen Jul. 1974 126 p refs
(Contract N62269-73-C-0743)
(AD-A007386; IFSM-74-66) Avail: NTIS CSCL 11/4

The mixed mode fracture of unidirectional composites is investigated by application of the strain energy density theory. Two analytical models are used. The first assumes that the composite is an ideal homogeneous anisotropic body, and the second assumes that failure takes place in a layer of matrix material whose edges are bonded to two orthotropic plates. The expressions for the strain energy density factor, S, are derived for both models, and brittle fracture is assumed to occur when the S-factor in an element of material ahead of the crack reaches a critical value, S sub c. Results are presented for E-glass fiber reinforced plastics, stainless steel fiber reinforced aluminum and graphite fiber epoxy materials and compared with available experimental data. The latter model is preferred as it accounts for the effect of nonhomogeneity that is inherent in the filament-reinforced composites. GRA

N75-23718# Purdue Univ., Lafayette, Ind. Thermophysical Properties Research Center.
DETERMINATION OF THERMAL PROPERTIES OF LAYER COMPOSITES BY FLASH METHOD Interim Report, 1 Sep. 1973 - 31 Dec. 1974
H. J. Lee and R. E. Taylor Dec. 1974 35 p refs
(Grant NSF GK-40032)
(PB-239114/2; PRF-7761) Avail: NTIS HC $3.75 CSCL 11D

The heat diffusion equations of three layer, two layer and homogeneous sytems are solved with appropriate boundary conditions, and with the use of a heat pulse function closely describing the actual pulse shape. However, a Kronecker delta function for the heat pulse is used when the half time is much larger than the heat pulse time. Furthermore the dimensional similarity analysis among the relative heat capacity, the square root of the relative heat diffusion time and the modified Fourier number is graphically represented. The method is in agreement with experimental results. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N75-23719 Illinois Univ., Urbana.
THE OXIDATION OF ETHYLENE IN AUTOMOTIVE ENGINE EXHAUST GAS; AN EXPERIMENTAL INVESTIGATION Ph.D. Thesis
Richard William Deller 1974 185 p
Avail: Univ. Microfilms Order No. 75-11763

The removal of the hydrocarbon emissions from automotive engine exhaust gas was effected by a thermal reactor. The removal of ethylene from exhaust gas under simulated thermal reactor conditions is studied. The exhaust gas is of variable composition and the composition of the reacting mixtures is quench sampled and analyzed by chemical and instrumental means. Results show that the ethylene removal rate was dependent not only on the oxygen concentration and the temperature but that it was also influenced by the nitric oxide concentration. The concentration of the active radicals, which is available to attack ethylene, is controlled by nitric oxide through a complex inhibition and reintroduction mechanism. Dissert. Abstr.

N75-23720 Illinois Univ., Urbana.
THE APPLICATION OF QUADRUPOLE MASS SPECTROMETRY TO NITROGEN ISOTOPE ANALYSIS Ph.D. Thesis
Larry Arthur Green 1974 97 p
Avail: Univ. Microfilms Order No. 75-11577

To alleviate many of the problems encountered with magnetic instruments, the use of a quadrupole mass spectrometer was proposed. A total system for performing routine nitrogen isotopic analysis is presented. The system allows for a high ratio of analyte gas to residual gas for analysis. Linearity of spectral sweep is improved so averaged spectra can be integrated to improve accuracy of ratio. Accuracy and precision of better than 0.2% is obtained. The construction and operation of a quadrupole mass spectrometer and associated systems are described. An interface for digitizing information from the mass analyzer and feeding it into the computer is described, as well as the entire data acquisition and readout programming. Results of analyses are presented to show the accuracy and precision obtainable with the system. Precision of the data is examined with respect to the number of mass spectra averaged, the number of points integrated, and the rate at which the data are acquired. Dissert. Abstr.

N75-23721 Illinois Univ., Urbana.
AN AUTOMATED APPROACH TO SOME BASIC SAMPLE HANDLING CONCEPTS Ph.D. Thesis
James Douglas Lowry 1974 107 p
Avail: Univ. Microfilms Order No. 75-11582

A discussion is presented of a number of existing sample-handling systems with respect to basic sample handling concepts. The individual sample handling steps discussed are the initial uptake of sample, aliquoting of sample and reagents, mixing and delivery of the prepared sample to the measuring system. The above steps are evaluated with respect to the quantity of sample and reagent(s) needed, their physical and chemical properties which effect their handling, the time scale on which the steps must be performed, and the accuracy and precision desired. Two automated sample-handling systems are described. The first is a sequential sample-handling system for an automated atomic emission/atomic fluorescence flame spectrometer and the second is a parallel-loading system for the fast miniature centrifugal analyzer. Dissert. Abstr.

N75-23722 Tennessee Univ., Knoxville.
APPLICATION OF THE RADIO FREQUENCY FURNACE TECHNIQUE TO ENVIRONMENTAL TRACE ANALYSIS, PART 1. THE APPLICABILITY OF HADAMARD TRANSFORM TECHNIQUES TO VISIBLE SPECTROSCOPY Ph.D. Thesis
Ronald Valgene Crosmun 1974 177 p
Avail: Univ. Microfilms Order No. 75-11154

A radio frequency furnace is described, and the application of this atomization source to the analysis of trace environmental samples by atomic absorption is demonstrated. Accuracy on the order of 8 percent at the low ppm level was obtained with such samples. The instrument is capable of rapid analysis and shows potential for routine analysis. A detailed description of the principles underlying the multiplex operation of a Hadamard transform spectrometer is given. It is determined that the successful operation in the UV-visible region of such an instrument may depend critically upon the type and character of the noise present in the spectrometer system. A detailed quantitative investigation of the noise produced by a large number of common spectrometric sources is described. The power spectra of these sources was obtained by direct Fourier analysis of the output of a selected 1P28 photomultiplier when illuminated by the source of interest. Dissert. Abstr.

N75-23723 Brown Univ., Providence, R.I.
FLAME SPREADING ON HORIZONTAL AND VERTICAL FUEL SURFACES Ph.D. Thesis
Allen Godden Hansen 1974 63 p
Avail: Univ. Microfilms Order No. 75-9168

Transient flame spreading over thermally thick vertical and horizontal solid fuel surfaces (polymethyl methacrylate) was experimentally studied. Spreading rates, pyrolysis region contours and mass loss rates were determined for both horizontal and vertical configurations, while surface temperature measurements were made for the horizontal case alone. For the vertical case, pyrolysis contours were shown to be dissimilar at different times. The mass loss varied over the whole range tested. For the horizontal case, the burning process was shown to be similar near the outer edge of the pyrolysis region, while the pyrolysis contours were nearly similar for different region diameters. Surface temperature measurements showed that the region of fuel preheating was confined to a small area just ahead of the flame. Dissert. Abstr.

N75-23724*# Scientific Translation Service, Santa Barbara, Calif.
X-RAY ANALYSIS OF METAL TRACES IN PETROLEUMS USING ION EXCHANGE MEMBRANES
Rudolf Louis Washington NASA May 1975 14 p refs Transl. into ENGLISH from Erdol und Kohle, Erdgas-Petrochem. (Hamburg), v. 23, no. 6, Jun. 1970 p 347-350
(Contract NASw-2483)
(NASA-TT-F-16288) Avail: NTIS HC $3.25 CSCL 07D

Following a short review of methods currently in use for the determination of metal traces in mineral oils, possibilities are discussed which by combination of two modern techniques lead to the same objective much more easily and rapidly. After separation from mineral oil, the tiny amounts of metal were concentrated upon ion exchange membranes which are subsequently analyzed by X-ray fluorescence. Metal contents far below 1 ppm may be determined in serial analyses without considering possible changes in ion valence. Author

N75-23725*# Kanner (Leo) Associates, Redwood City, Calif.
VARIATIONS IN THE WORK FUNCTION OF (100)W BY THE ADSORPTION OF OXYGEN, THE ADSORPTION OF CESIUM AND THE COADSORPTION OF OXYGEN AND CESIUM
J. L. Desplat Washington NASA May 1975 11 p refs Transl. into ENGLISH from Surface Sci. (France), v. 34, 1973 p 588-596
(Contract NASw-2481)
(NASA-TT-F-16364) Avail: NTIS HC $3.25 CSCL 07D

The work-function determination by the Kelvin method was used to study the adsoption of oxygen, the adsorption of cesium and, the co-adsorption of oxygen and cesium on a (100) tungsten surface at room temperature. The work-function change of the clean surface with the oxygen exposure was used to estimate the sticking coefficient and the dipole moment of adsorbed oxygen. During cesium deposition on the clean surface, minimum at 1.58 eV and a plateau at 1.80 eV were obtained. Starting from the minimum obtained with cesium, oxygen adsorption leads to a decrease of the work-function down to 1.17 eV, when

cesium adsorption on a previously oxygenated surface gives a 1.12 eV minimum and an increase of the plateau up to 2.20 eV. This last variation is shown to be consistent with the observed increase of the dipole moment of cesium adsorbed on a partially oxygenated surface, which also accounts for the lowering of the work function minimum. Author

N75-23726*# Michigan Univ., Ann Arbor. High Altitude Engineering Lab.
TRANSMISSIVITY OF CARBON MONOXIDE IN THE 2.3 MICRONS BAND REGION Final Report
S. R. Drayson, R. K. Tallamraju, L. W. Chaney, and A. D. Matthias May 1975 24 p refs
(Grant NGR-23-005-538; ORA Proj. 010808)
(NASA-CR-142869; UMICH-010808-1-F) Avail: NTIS HC $3.75 CSCL 07D

Line strengths and self and nitrogen broadened half-widths have been determined from high resolution spectroscopic measurements of selected lines in the 2.3 micrometer band region of CO. The CO 0-2 total band strength is estimated to be 2.086 + or - 0.146 cm/1 (ATM-cm)/1 STP which is higher than most previously reported values. The line half-widths are also generally higher than those in the literature. Author

N75-23727*# Nevada Engineering and Technology Corp., Long Beach, Calif.
CORRELATION OF MATERIALS PROPERTIES WITH THE ATOMIC DENSITY CONCEPT Interim Final Report
1975 98 p refs
(Contract NAS8-28517)
(NASA-CR-120751) Avail: NTIS HC $4.75 CSCL 07D

Based on the hypothesis that the number of atoms per unit volume, accurately calculable for any substance of known real density and chemical composition, various characterizing parameters (energy levels of electrons interacting among atoms of the same or different kinds, atomic mass, bond intensity) were chosen for study. A multiple exponential equation was derived to express the relationship. Various properties were examined, and correlated with the various parameters. Some of the properties considered were: (1) heat of atomization, (2) boiling point, (3) melting point, (4) shear elastic modulus of cubic crystals, (5) thermal conductivity, and (6) refractive index for transparent substances. The solid elements and alkali halides were the materials studied. It is concluded that the number of different properties can quantitively be described by a common group of parameters for the solid elements, and a wide variety of compounds. Author

N75-23728# California Univ., Livermore. Lawrence Livermore Lab.
AUTOMATION TRENDS
J. W. Frazer 6 Apr. 1974 11 p refs Presented at the 25th Pittsburgh Conf. on Analytical Chem. and Appl. Spectry., Cleveland, 4 Mar. 1974 Sponsored by ERDA
(UCRL-75320; Conf-740314-5) Avail: NTIS HC $3.25

Digital computer automation and related technological breakthroughs are forces resulting in changes in chemical and physical measurements. The important features of these complex measurements are occurring in process control in manufacturing processes; quality control; problems associated with the control of pollution; and clinical analysis. It is predicted that instruments will be interconnected in a distributive and/or hierarchical computer system due to the need for transmission of information, instrument control from remote sites, for software development, and improved scientific management. The methodology for future instrumentation is followed for the nuclear fuel industry. NSA

N75-23729# Battelle-Northwest, Richland, Wash.
STRONTIUM FLUORIDE COMPATIBILITY PROGRAM Quarterly Report for period ending 30 Jun. 1974
H. T. Fullam Nov. 1974 21 p refs
(Contract AT(45-1)-1830)
(BNWL-1845-1) Avail: NTIS HC $3.25

In the tests nine containment materials are being evaluated with four different grades of SrF2 at 800, 1000 and 1100 C. The first series of tests with high-purity nonradioactive SrF2 was completed and couple interaction evaluated. The second series of tests with high-purity Sr-90F2 was completed and the couples were evaluated. The third series of tests with Sr-90F2 was completed and the couples were evaluated. The fourth series of tests using high-purity nonradioactive SrF2 with controlled levels of added impurities are underway. Based on the results of the short-term tests, three containment materials will be selected for long-term compatibility testing. Work was started on a thermodynamic analysis of potential reactions between SrF2, its decay product, contained impurities, and the nine containment materials under consideration; a computer program was developed to make the necessary free energy calculations. Author (NSA)

N75-23730# Atomic Energy Board, Pretoria (South Africa).
THERMODYNAMIC PROPERTIES AND PHASE DIAGRAM OF TERNARY SODIUM ALLOYS. 1: THE SYSTEM SODIUM PLUS CADMIUM PLUS INDIUM
A. J. Neethling Apr. 1974 21 p refs
(PEL-230) Avail: ERDA Depository Libraries HC $4.25

Electromotive force measurements in the temperature range 670 to 760 K were used to determine the thermodynamic properties of the sodium component of the ternary sodium + cadmium + indium system. Darken's method was used to calculate the corresponding properties for the cadmium and indium components. The solid-liquid equilibrium surface for the system was also determined using thermal analysis. The maximum equilibrium temperature recorded was 745 K. Author (NSA)

N75-23731# Illinois Univ., Urbana. Coordinated Science Lab.
INVESTIGATION OF HYDROGEN CHEMISORPTION ON THE TUNGSTEN (100) SURFACE
Stephen Parker Withrow Mar. 1975 201 p refs
(Contract DAAB07-72-C-0259)
(AD-A007434; R-674; UILU-ENG-75-2208) Avail: NTIS CSCL 07/4

A new apparatus for surface studies has been constructed and placed in operation. The instrument incorporates a monoenergetic beam of electrons, a high resolution, high sensitivity electrostatic energy spectrometer for electrons and ions, plus other hardware and electronics necessary to perform work function measurements, Auger electron spectroscopy, electron stimulated desorption of ions, low energy electron diffraction, and electron scattering energy loss measurements. It has been used to investigate geometric, energetic, and kinetic properties associated with the chemisorption of hydrogen on a single crystal tungsten (100) surface over a temperature range from 60C to -150C. GRA

N75-23732# Johns Hopkins Univ., Baltimore, Md.
HIGH RESOLUTION SPECTRA OF RARE EARTH CRYSTALS Final Report, 2 Oct. 1969 - 30 Sep. 1973
H. M. Crosswhite Mar. 1974 8 p refs
(Contract DAHC04-70-C-0007)
(AD-A007262; ARO-8444-3-P) Avail: NTIS CSCL 07/4

Energy levels derived from the spectra of triply-ionized rare earths in hexagonal lanthanum trichloride single crystals have been reinterpreted using an expanded Hamiltonian including two- and three-body electrostatic and two-body magnetic effective operators in the free-ion part, and two-body crystal field operators added to the crystal interaction part. A method has been developed for dealing with the very large matrix dimensions encountered for ions in the middle of the series. GRA

N75-23733# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
TIMAV1: A COMPUTER PROGRAM TO TIME-AVERAGE REPETITIVELY SCANNED DIGITIZED SPECTRA Final Report, 1 Jul. 1971 - 31 Mar. 1974
Raymond C. Waggoner, Roger E. Rondeau, and Vincent L. Donlan Dec. 1974 38 p
(AF Proj. 7360; AF Proj. 7367)
(AD-A007849; AFML-TR-74-121) Avail: NTIS CSCL 07/4

Program TIMAV1 (TIMe-AVeraging) is a FORTRAN routine for a digital computer and may be used to time-average repetitively scanned, digitally recorded spectra. It identifies the highest peak in a designated section of the data and sums the many spectra so that the highest peak of each file is located at the same line in the summation. In this report TIMAV1 is described in detail, the procedure for its use is given, and an illustration of its use

is shown for time-averaging noisy nuclear magnetic resonance spectra of a complex dye of low solubility. GRA

N75-23734# Naval Research Lab., Washington, D.C.
A METHOD FOR DETERMINING OIL IN WATER
Aristides Stamulis Mar. 1974 19 p refs
(AD-A007871; NRL-MR-2741) Avail: NTIS CSCL 07/3

A preliminary study has been made on a dye technique for determining the concentration of small amounts of oil in water. The mixing action of a blender results in the formation of a large number of oil droplets in water from one original oil drop. The subsequent addition of a suitable amount of oil-soluble dye to the system with additional blending action results in a homogeneous colored solution. Hence, low concentrations of oil in water can be visually determined. Under laboratory conditions, using tap water as the continuous phase, test oils such as crudes, esters, paraffins and silicones gave positive results. However, protective colloid action in some cases masked the color test. The converse of the principle, i.e., the determination of water-in-oil, is also possible using a water soluble dye. GRA

N75-23735# Aerospace Corp., El Segundo, Calif. Lab. Operations.
REACTION RATES AND ENERGY DISTRIBUTIONS AMONG REACTION PRODUCTS FOR THE H PLUS Cl2 AND Cl PLUS H2 REACTIONS Interim Report
Roger L. Wickins 21 Feb. 1975 32 p refs
(Contract F04701-74-C-0075)
(AD-A007782; TR-0075(5530)-11; SAMSO-TR-75-53) Avail: NTIS CSCL 07/4

Rate coefficients have been calculated for the bimolecular exchange reactions of H with Cl2 and Cl with H2. Three-dimensional classical trajectories of the collision dynamics of these reactions have been calculated by means of the London-Eyring-Polanyi-Sato (LEPS) potential energy surfaces. Energy transfer and distribution are discussed. GRA

N75-23736# Army Materials and Mechanics Research Center, Watertown, Mass.
DETERMINATION OF FLUORIDE IN FLUOMICA AND FLUOMICA-ALUMINA COMPOSITES WITH THE FLUORIDE ELECTRODE Final Report
Thomas A. Ferraro, Jr. Feb. 1975 15 p refs
(DA Proj. 1P8-65801-MM-11)
(AD-A007764; AMMRC-PTR-75-1) Avail: NTIS CSCL 07/4

Fluoride is determined in barium fluomica and barium fluomica-alumina composites by direct potentiometric measurement with a fluoride specific-ion electrode. Measurements at pH 8 and pH 12 are compared using different methods of sample decomposition and preparation. Since the fluoride recoveries are the same in each case, direct measurement in an aqueous sodium carbonate medium is the method of choice. This method is simple and rapid since the addition of complexing and buffering agents is not required nor is the adjustment of pH necessary. GRA

N75-23737# National Bureau of Standards, Washington, D.C.
PROBLEMS IN COMBUSTION AND EXTINGUISHMENT
I. V. Rhabov, A. N. Baratov, and I. I. Petrov 1974 209 p refs Transl. into ENGLISH of the book "Problemy Goreniya i Tusheniya" Moscow, Sbornik statei, 1968 200 p Sponsored in part by NSF
(TT-71-58001) Avail: NTIS HC $7.25 CSCL 21B

The aim of this book is to acquaint fire prevention specialists with research on the combustion processes of matter under fire conditions and effective means and methods of fire prevention. Sixteen papers are included covering various aspects of fire and extinguishing agents and apparatus and chemical and thermophysical flame processes. GRA

N75-23738# Amerind Publishing Co. Pvt. Ltd., New Delhi (India).
THERMOPHYSICAL PROPERTIES OF MATTER AND SUBSTANCES, VOLUME 2
V. A. Rabinovich, ed. 1974 385 p Transl. into ENGLISH from the book "Teplo Fizicheskie Veshchestv i Materialov, Vypusk 2" Komitet Standartov, Mer i Izmeritel'nykh Priborov Prepared in cooperation with NSF, and NBS, Washington, D.C.
(TT-72-52001-Vol-2) Avail: NTIS HC $10.25 CSCL 07D

A series of articles is presented on air and its components, hydrogen and monatomic gases, hydrocarbons and their derivatives, carbon dioxide, metals and their components, and mixtures and solutions. Topics discussed included thermal properties of liquids, modal volumes of nitrogen, compressibility of gas by the displacement method, parahydrogen, equations of state for liquid and gaseous helium, specific heats of liquids and gases, argon, rarefied gas dynamics, critical temperatures, thermal conductivity, freon, thermal expansions, and diffusion coefficients. M.J.S.

N75-23739# Texas Univ., Austin. Electronics Research Center.
TABLES OF SCATTERING AMPLITUDES, SPIN POLARIZATIONS AND PHASE SHIFTS OF 25 eV TO 1500 eV ELECTRONS SCATTERED ELASTICALLY FROM Li, Na, Mg, P, K, Ca, Sc, Mn, Ga, Br, Sr, Mo, Rh, Cd, Ba, W, AND Os, 3
Donald C. Gregory and Manfred Fink 15 Aug. 1974 283 p refs
(Contract F44620-71-C-0091)
(AD-A007055; TR-160; AFOSR-75-0390TR) Avail: NTIS CSCL 07/4

The Dirac equation was solved numerically by the method of partial waves in order to obtain elastic low-energy electron scattering factors for selected elements at ten energies. From the complex scattering amplitudes, the differential cross sections and spin polarization factors were calculated. In addition, the phase shifts for these elements at five more energies have been included. Since the exchange of the incoming electron with the atomic electrons and the charge cloud polarization are not taken into account in these calculations, the scattering factors at angles of less than 10 degrees should be used with caution. The three reports in this series can be used as a basis for interpolation to obtain the differential cross sections for all additional elements and all intermediate energies. GRA

N75-23740# Wyoming Univ., Laramie.
THE DIRECT PRODUCTION OF HYDROCARBONS FROM COAL-STEAM SYSTEMS Final Report, Nov. 1968 - Nov. 1973
Jan. 1975 87 p refs
(Contract DI-14-01-0001-1196)
(PB-239356/9; OCR-80-f) Avail: NTIS MF $2.25; SOD HC $4.65 as C.I163.10:80 CSCL 07A

Experiments were carried out on the use of a multiple catalyst system consisting of potassium carbonate and a commercial nickel methanation catalyst for the direct production of methane from coal-steam reactions. This system combines the effects of these catalysts to produce in a single-step conversion a product gas consisting primarily of methane and carbon dioxide with a CO2-free heating value as high as 850 Btu per SCF. Two of the apparent problems inherent with such a system were catalyst recovery and the loss of catalyst activity over prolonged periods of time at the conversion temperatures in the presence of the various reactants produced from the coal gasification. GRA

N75-23741# Iowa State Univ. of Science and Technology, Ames.
COAL PROCESSING BY ELECTROFLUIDICS Interim Report, Mar. - Aug. 1974
Jan. 1975 133 p refs
(Contract DI-14-01-0001-479)
(PB-238973/2; OCR-30-INT-3) Avail: NTIS HC $5.75 CSCL 07A

The results of research on the electrical characteristics of electrofluid reactors are summarized. Since the total resistance between electrodes placed in a fluidized bed includes both a contribution from the resistance of the bed and the electrode-to-bed contact resistance, measurements were made of the total bed and contact resistances. Also reported are studies of arcing in the electrofluid reactor and a summary of methods for predicting the electrical properties of such systems. GRA

N75-23742# National Bureau of Standards, Washington, D.C. Center for Fire Research.
RADIATIVE HEAT TRANSFER FROM PRODUCTS OF COMBUSTION IN BUILDING CORRIDOR FIRES Final Report

Kevin Bromberg and James Quintiere Feb. 1975 29 p refs (COM-75-10209; NBSIR-74-596) Avail: NTIS HC $3.75 CSCL 13L

The contribution of radiative heat transfer from hot combustion products to corridor floors is examined. Data from full-scale corridor fire experiments is used to calculate emissivity and absorptivity of the combustion products. An empirical model based on attenuation by absorption is used to specify the absorption coefficient due to particulates in the products. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-23743 Purdue Univ., Lafayette, Ind.
INTERSTITIAL RELAXATIONS DUE TO HYDROSTATIC STRESS IN NIOBIUM-OXYGEN ALLOYS Ph.D. Thesis
Surendra Nath Tewari 1974 153 p
Avail: Univ. Microfilms Order No. 75-10970

Experimental investigations of the anelastic relaxation induced by hydrostatic stress in the range from ambient to 81 ksi (5.5 kbar) were made for niobium-oxygen alloys. The anelastic responses, both for the pressurization and the pressure release experiments, were followed by measuring the relative length change between the oxygenated niobium sample and a pure niobium frame with a precision of about 2 A. The relaxation spectrum observed was shown to be made up of three distinct relaxations with unique relaxation times and strengths. The pressure dependence of the relaxation times gave the apparent activation volume for these relaxations of the order of 4 cu cm/mole. The relaxations were observed to have relaxations strengths of the order of 0.0001 which were found to be independent of pressure up to 81 ksi. The relaxation times for these relaxations were found to occur in the same general temperature range as those for the Snoek relaxations of oxygen clusters in niobium. Dissert. Abstr.

N75-23744 Syracuse Univ., N.Y.
A CHEMICAL BOND APPROACH TO METALS AND ALLOYS Ph.D. Thesis
Devlin Michael Gualtieri 1974 143 p
Avail: Univ. Microfilms Order No. 75-10543

The BCS theory of superconductivity was extended to the transition elements and their alloys by a chemical bond approach based on the electronic configurations of the Engel-Brewer theory of alloys. The net attractive potential between electrons in Cooper pairs, VBCS, for the late transition series elements and alloys is shown to arise mainly from a generalized electron-electron interaction related to bonding of electrons on the d level alone, the phonon-induced attraction being nearly zero. A mechanism is proposed in which a scattering of superconducting d electrons into nonsuperconducting s and p states is responsible for a predictable reduction in VBCS. The electron-per-atom ratio and a new chemical parameter, the average atomic radius for coordination twelve, were applied successfully to the prediction of the maximum energy product of multiphase commercial permanent magnets. Dissert. Abstr.

N75-23745 Syracuse Univ., N.Y.
SURFACE STUDIES OF COBALT ALLOYS IN ULTRA HIGH VACUUM UTILIZING CONTACT RESISTANCE Ph.D. Thesis
John Frank Catalano 1974 83 p
Avail: Univ. Microfilms Order No. 75-9723

The utilization of the contact resistance in an ultra high vacuum environment as an experimental observable, which is capable of yielding information concerning surface phenomena, is explored from theoretical, electrical, and mechanical foundations to applications in the prediction of adhesion and friction properties. The classical crossed rod experiment was used to obtain the contact resistance versus applied load plots for three cobalt - rhenium alloy systems. Thus, the effect of alloying on the contact resistance was also investigated. This work was supported by scanning electron microscopy surface studies. Since these experiments were done in ultra high vacuum and ultra clean surfaces, the effectiveness of various surface cleaning techniques was explored via the contact resistance. A discrepancy between ac and dc sensing potentials on the resulting contact resistance was found under particular conditions. Dissert. Abstr.

N75-23746 Iowa State Univ. of Science and Technology, Ames.
STRUCTURE AND PROPERTIES OF STEELS THEROMOMECHANICALLY PROCESSED BY IMPACT EXTRUSION Ph.D. Thesis
Vernon Frank Mayer 1974 126 p
(Contract W-7405-eng-82)
(AEC-IS-T-652) Avail: Univ. Microfilms Order No. 75-10490

Several steels, AISI 4340, 440A stainless steel, and AISI 1020, were thermomechanically treated by impact extruding their metastable austenites at various temperatures and extrusion ratios directly into a quenching medium oil. The effectiveness of this process was assessed by comparing tensile test results of the impact extruded steel with those from the same steel given conventional heat treatment. Thermomechanical treatment using impact extrusion as the deformation process increases the strength of steel about the same amount as thermomechanical treatments using conventional deformation processes like rolling. Increases in yield strength of as much as 14% and 24% were measured for AISI 4340 and 440A respectively. These strength increases are not accompanied by significant decreases in area reduction or elongation. Transmission electron micrographs of steels given both thermomechanical treatment and conventional heat treatment were compared and the results are included.
Dissert. Abstr.

N75-23747 Ohio State Univ., Columbus.
FIELD ION MICROSCOPIC STUDY OF FILMS OF MOLYBDENUM, PLATINUM AND TANTALUM VAPOR DEPOSITED ON TUNGSTEN Ph.D. Thesis
Antwi Boateng 1974 171 p
Avail: Univ. Microfilms Order No. 75-11317

The relationships between the physical properties and structure of thin films of metals and other materials were the subject of extensive study, because thin films are used in a variety of technological applications, e.g., in integrated electronic circuits. A Type 304 stainless steel field ion microscope (FIM) was built and used to study films of Mo, Pt and Ta vapor deposited on W emitter substrates. The microscope was provided with a channel plate image intensifier and there was provision for complete coverage of the emitter substrate by the incident vapor. The imaging gas was helium and the microscope was operated at 78 K. The studies of Mo films were done on bicrystalline as well as monocrystalline W substrates. Mo films prepared at 78 K were initially pseudomorphic and several layers thick before the onset of nucleation and growth of Mo crystallites. Dissert. Abstr.

N75-23748 Ohio State Univ., Columbus.
CORROSION FATIGUE OF TYPE 304 STAINLESS STEEL IN H_2SO_4 + NaCl AT 25 C Ph.D. Thesis
Ahmad Moccari 1974 251 p
Avail: Univ. Microfilms Order No. 75-11399

Corrosion fatigue tests were conducted on reversed bend type 304 stainless steel specimens in concentrated H_2SO_4 solution with and without NaCl additions. The following information was obtained: S-N curves with the concentration of H_2SO_4 and NaCl as the variable; the open-circuit potential with time at a given applied stress; the fatigue life; the effects of organic and inorganic inhibitors on the fatigue life at a given applied potential; stages of the crack initiation at several applied potentials; crack initiation in air at a given applied stress; and the effects of the applied potential; the cyclic frequency, the stress ratio and the applied stress on the fracture mode. The general results show that the fatigue life of 304 stainless steel is lower in H_2SO_4 solution than in air and decreased still further with addition of NaCl. Dissert. Abstr.

N75-23749 Ecole Centrale des Arts et Manufactures, Chatenay-Malabry (France). Lab. de Physique.
DETERMINATION OF THE SHAPE, SIZE, AND ORIENTATION OF DEFECTS BY ULTRASONIC TESTS Final Report [DETERMINATION DE LA FORME, LA GROSSEUR ET L'ORIENTATION DES DEFAUTS PAR EXPLORATION ULTRASONORE]

Y. Villaret, D. deVadder, P. Azou, and P. Bastien Oct. 1973 66 p ref In FRENCH
(Contract DGRST-71-7-2903)
Avail: Issuing Activity

Flaws in steel and copper were found using sonar techniques. A theoretical approach and the experimental procedures are described. The results on rectangular, cylindrical, circular and ellipsoidal defects are discussed. ESRO

N75-23750# Technische Universitaet, Munich (West Germany).
ANOMALOUS HALL EFFECT IN METALS WITH SMALL CONCENTRATIONS OF LOCALIZED MAGNETIC DEFECTS Ph.D. Thesis [ANOMALER HALL-EFFEKT IN METALLEN MIT KLEINEN KONZENTRATIONEN LOKALISIERTER MAGNETISCHER FEHLSTELLEN]
Hans-Juergen Schirlitzki 1974 73 p refs In GERMAN
Avail: NTIS HC $4.25

A resolving matrix representation for conductance is used to study the Hall constant dependence on the magnetic field in diluted magnetic alloys. It is shown that the anomalous Hall effect is triggered mainly by freezing of spin flip terms in electron reaction time, or by an anomalous Hall field caused by coupling of the spin gap with skew skattered conduction electrons.
Transl. by G.G.

N75-23751# Technische Universitaet, Munich (West Germany).
RESEARCH ON THE INFLUENCE OF DISLOCATIONS ON THE DIFFRACTION OF X RAYS AND GAMMA RAYS ON COPPER SINGLE CRYSTALS Ph.D. Thesis [UNTERSUCHUNG DES EINFLUSSES VON VERSETZUNGEN AUF DIE BEUGUNG VON RONTGEN- UND GAMMASTRAHLEN AN KUPFEREINKRISTALLEN]
Andreas Freund [1974] 170 p refs In GERMAN
Avail: NTIS HC $6.25

Diffractometric and X-ray spectrometric analyses on single copper crystal lattices show that diffraction profile broadening depends much more on dislocation configurations than on dynamic bending effects. A model mosaic crystal lattice structure is developed that provides for profile broadening as well as for integral reflex possibilities crystal. Transl. by G.G.

N75-23752*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SODIUM SULFATE: VAPORIZATION THERMODYNAMICS AND ROLE IN CORROSIVE FLAMES
Fred J. Kohl 1975 25 p refs Presented at the Intern. Symp. on Metal-Slag-Gas Reactions and Process., Toronto, Can., 11-16 May 1975; sponsored by Electrochem. Soc.
(NASA-TM-X-71641; E-8181) Avail: NTIS HC $3.25 CSCL 07D

Gaseous species over liquid Na2SO4 were identified by the technique of molecular beam mass spectrometry. The heat and entropy of vaporization of the Na2SO4 molecule were measured directly. Comparisons of the experimental entropy with values calculated using various molecular parameters were used to estimate the molecular structure and vibrational frequencies. The thermodynamic properties of gaseous and condensed phase Na2SO4, along with additional pertinent species, were used in a computer program to calculate equilibrium flame compositions and temperatures for representative turbine engine and burner rig flames. Compositions were calculated at various fuel-to-oxidant ratios with additions of sulfur to the fuel and the components of sea salt to the intake air. Temperatures for condensation of Na2SO4 were obtained as a function of sulfur and sea salt concentrations. Author

N75-23753*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VARIATION OF SOLAR-SELECTIVE PROPERTIES OF BLACK CHROME WITH PLATING TIME
Glen E. McDonald and Harry B. Curtis May 1975 10 p refs
(NASA-TM-X-71731; E-8356) Avail: NTIS HC $3.25 CSCL 11C

The spectral reflectance properties of a commercially prepared black chrome over dull nickel, both plated on steel, for various plating times of the black chrome were measured. The plating current was 180 amperes per square foot. Values of absorptance integrated over the solar spectrum, and of infrared emittance integrated over black-body radiation at 250 F were obtained. It is shown that plating between one and two minutes produces the optimum combination of highest heat absorbed and lowest heat lost by radiation. Author

N75-23754*# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
ANALYSIS OF THERMAL STRESSES AND METAL MOVEMENT DURING WELDING Phase Report, 14 Oct. 1970 - 21 Jun. 1973
T. Muraki and K. Masubuchi 21 Jun. 1973 293 p refs
(Contract NAS8-24365; DSR Proj. 71648)
(NASA-CR-120757; Rept-73-16) Avail: NTIS HC $8.75 CSCL 11F

The research is reported concerning the development of a system of mathematical solutions and computer programs for one- and two-dimensional analyses for thermal stresses. Reports presented include: the investigation of thermal stress and buckling of tantalum and columbium sheet; and analysis of two dimensional thermal strains and metal movement during welding. F.O.S.

N75-23755*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
EXAMINATION OF THE INFLUENCE OF COATINGS ON THIN SUPERALLOY SECTIONS. VOLUME 1: DESCRIPTION AND ANALYSIS
Murray Kaufman Dec. 1974 135 p refs
(Contract NAS3-16759)
(NASA-CR-134791) Avail: NTIS HC $5.75 CSCL 11C

The effects of an aluminide coating and of section thickness were investigated on two cast nickel-base superalloys. Cast section thickness ranged from 0.038 cm to 0.15 cm. Simulated engine exposures in a jet fuel burner rig with cyclic air cooling were studied. The effects of surface machining before coating and re-machining and re-coating after exposures were examined. The properties evaluated included tensile strength, stress rupture, high-cycle mechanical fatigue, and thermal fatigue. A metallurgical analysis was made of the microstructures of the coated and uncoated alloy. Author

N75-23756*# General Electric Co., Cincinnati, Ohio.
EXAMINATION OF THE INFLUENCE OF COATINGS ON THIN SUPERALLOY SECTIONS. VOLUME 2: DETAILED PROCEDURES AND DATA
Murray Kaufman Dec. 1974 153 p refs
(Contract NAS3-16759)
(NASA-CR-134792) Avail: NTIS HC $6.25 CSCL 11C

The effects of an aluminide coating, Codep B-1, and of section thickness were investigated on two cast nickel base superalloys, Rene 80 and Rene 120. Cast section thicknesses ranged from 0.038 cm to 0.15 cm. Simulated engine exposures for 1000 hours at 899C or 982C in a jet fuel burner rig with cyclic air cooling were studied, as were the effects of surface machining before coating and re-machining and re-coating after exposures. The properties evaluated included tensile at room temperature., 871C and 982C, stress rupture at 760C, 871C, 982C and 1093C, high cycle mechanical fatigue at room temperature., and thermal fatigue with a 1093C peak temperature. Thin sections had tensile strengths similar to standard size bars up to 871C and lower strengths at 982C and above, with equivalent elongation, and stress rupture life was lower for thin sections at all test conditions. The aluminide coating lowered tensile and rupture strengths up to 871C, with greater effects on thinner specimens. Elevated temperature exposure lowered tensile and rupture strengths of thinner specimens at the lower test temperatures. Surface machining had little effect on properties, but re-matchining after exposure reduced thickness and increased metallurgical changes enough to lower properties at most test conditions. Author

N75-23757*# Scientific Translation Service, Santa Barbara, Calif.
DIFFUSION LAYERS FORMED IN SALT MEDIA AND MOLTEN OXIDES
H. VanderPoorten, A. DeHaan, and R. Olivier Washington NASA Jun. 1975 21 p refs Transl. into ENGLISH from Silicates Ind. (Belgium), v. 38, no. 11, 1973 p 223-231
(Contract NASw-2483)

(NASA-TT-F-16381) Avail: NTIS HC $3.25 CSCL 13H

Spontaneous and electrolytic deposition hot-doping procedures are described and used to develop diffusion coatings in molten media. Electrolysis at high temperatures was used to achieve a deposit of aluminum on nickel and of silicon on molybdenum in molten chloride and silicate baths. X-ray diffraction analysis and tests of micro-hardness were used to study layer formation. The influence of shape, and the effects of cathode rotation, temperature, and current density are considered. Diffusion coefficients for Si-Md diffusion are calculated. The results of both procedures are compared with each other and with results of previous gaseous cementation experiments. L.B.

N75-23758*# Aluminum Co. of America, Pittsburgh, Pa.
INVESTIGATION OF SMOOTH SPECIMEN SCC TEST PROCEDURES; VARIATIONS IN ENVIRONMENT, SPECIMEN SIZE, STRESSING FRAME, AND STRESS STATE Final Report, 1 Jul. 1969 - 29 Feb. 1972
B. W. Lifka, D. O. Sprowls, and R. A. Kelsey 12 May 1975 93 p refs
(Contract NAS8-21487)
(NASA-CR-120752) Avail: NTIS HC $4.75 CSCL 13H

The variables studied in the stress-corrosion cracking performance of high strength aluminum alloys were: (1) corrosiveness of the environment, (2) specimen size and stiffness of the stressing system, (3) interpretation of transgranular cracking, and (4) interaction of the state of stress and specimen orientation in a product with an anisotropic grain structure. It was shown that the probability of failure and time to fracture for a specimen loaded in direct tension are influenced by corrosion pattern, the stressing assembly stiffness, and the notch tensile strength of the alloy. Results demonstrate that the combination of a normal tension stress and a shear stress acting on the plane of maximum susceptibility in a product with a highly directional grain cause the greatest tendency for stress-corrosion cracking. L.B.

N75-23759*# Alabama Univ., Huntsville. School of Graduate Studies and Research.
STUDIES ON IMMISCIBLE ALLOYS Semiannual Progress Report, 1 Sep. 1974 - 28 Feb. 1975
Guenther H. Otto Mar. 1975 52 p refs
(Contract NAS8-27809)
(NASA-CR-120764; SAPR-3) Avail: NTIS HC $4.25 CSCL 11F

The immiscible couple Ga-Bi was processed in a low-gravity environment to avoid density segregation diffculties and to obtain a fine and homogenous dispersion of the components. The Ga-Bi alloys were cooled through the immiscibility gap during 4 seconds of free fall in a drop tower. Various degrees of dispersions were obtained and were reflected by the presence of unexpected electrical properties. Resistivity and superconductivity measurements on additional drop tower processed Ga-Bi samples and on ground control samples are presented. The melting of a cylindrical piece of ice in ambient temperature performed in a low-gravity environment is also discussed. An explanation for the observed melting behavior is given and good agreement with control data is shown. Author

N75-23760*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODIFIED FERRITIC IRON ALLOYS WITH IMPROVED HIGH-TEMPERATURE MECHANICAL PROPERTIES AND OXIDATION RESISTANCE
Robert E. Oldrieve Washington Jun. 1975 35 p refs
(NASA-TN-D-7966; E-8185) Avail: NTIS HC $3.75 CSCL 11F

An alloy modification program was conducted in which the compositions of two existing Fe-Cr-Al alloys (Armco 18SR and GE-1541) were changed to achieve either improved high-temperature strength or improved fabricability. Only modifications of Armco 18SR were successful in achieving increased strength without loss of fabricability or oxidation resistance. The best modified alloy, designated NASA-18T, had twice the rupture strength of Armco 18SR at 800 and 1000 C. The NASA-18T alloy also had better oxidation resistance than Armco 18SR and comparable fabricability. The nominal composition of NASA-18T is Fe-18Cr-2Al-1Si-1.25Ta. All attempted modifications of the GE-1541 alloy were unsuccessful in terms of achieving better fabricability without sacrificing high-temperature strength and oxidation resistance. Author

N75-23761*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF SILICON ADDITIONS ON OXIDATION AND MECHANICAL BEHAVIOR OF THE NICKEL-BASE SUPERALLOY B-1900
Robert V. Miner, Jr. and Carl E. Lowell Washington Jun. 1975 32 p refs
(NASA-TN-D-7989; E-8248) Avail: NTIS HC $3.75 CSCL 11F

Test specimens with nominal additions of Si were tested in oxidation, thermal fatigue, sulfidation, tension, and stress rupture, and were also extensively studied metallographically. Alloy B-1900 modified with 0.6- or 1.2-wt% Si exhibited oxidation resistance equivalent to that of aluminide-coated B-1900 during cyclic, high-gas-velocity oxidation tests. Resistances to thermal fatigue and sulfidation were improved by the Si additions, but were not superior to aluminide-coated B-1900. Stress-rupture tests at 1000 C of specimens given the standard heat treatment to simulate an aluminide coating cycle showed Si to be detrimental. However, application of another heat treatment increased the rupture life of the alloy with 0.6-wt% Si to that of the unmodified B-1900 given the standard heat treatment. Author

N75-23762# Aktiebolaget Atomenergi, Studsvik (Sweden).
OBSERVATIONS OF PHASES AND VOLUME CHANGES DURING PRECIPITATION OF HYDRIDE IN ZIRCONIUM ALLOYS
G. Oestberg, H. Bergqvist, K. Petterson, R. Atterno, K. Norrgard, L. G. Jansson, and K. Malen Oct. 1974 13 p refs
(AE-499) Avail: ERDA Depository Libraries HC $4.00

The effects of hydride on the properties of zirconium alloys depend, among other things, on the nature or crystallographic modification of the hydride, and the volume changes associated with its formation. Observations relating to the occurrence in various alloys of gamma and delta hydrides, respectively, and the volume changes during precipitation of delta hydride are described and discussed with reference to earlier work in this field. Author (NSA)

N75-23763# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
VOID NUCLEATION AND GROWTH IN HEAVY ION AND ELECTRON BOMBARDED PURE METALS Progress Report, 1 Mar. - 1 Dec. 1974
G. L. Kulcinski and R. A. Dodd 1974 75 p refs
(Contract AT(11-1)-2206)
(COO-2206-5) Avail: NTIS HC $4.25

Irradiation of high-purity Al with 1.2 to 1.4-MeV Al ions 30 to 120 C revealed that He has very strong influence on void formation. No voids could be formed in Al without He even up to 2.7 dpa. Samples preinjected, with 0.1, 1, and 10 appm He and then irradiated at 100 and 120 C produced voids at damage levels of approximately 0.5 dpa. Void size and density varied with temperature and the voids were determined to be (111) octahedra. A high-temperature (1100 C) and high-vacuum sample irradiation chamber was constructed and operated. A residual gas analyzer was used to determine the partial pressures of the gases in the chamber during high-temperature irradiation of V. Voids were produced in high purity V during bombardment at 700 C with 14-MeV copper ions. The average void size is approximately 1000A, larger than previous values. The EM-7 1 MeV TEM has been placed into full operation for irradiation studies. Well-annealed Al, without preinjected helium, has been irradiated in this microscope at 37 to 150 C to approximately 0.9 dpa. Author (NSA)

N75-23764# Georgetown Univ., Washington, D.C. Dept. of Physics.
STUDY OF VERY PURE METALS AT LOW TEMPERATURE Progress Report
Sep. 1974 82 p refs
(Contract AT(40-1)-3665)
(ORO-3665-44) Avail: NTIS HC $4.75

Research progress is reported on nonequilibrium superconductors, superconducting transitions near 14 K continuous warming

specific heat measuring methods, ac susceptibility methods, tunnel junction studies, and high transition temperature materials. NSA

N75-23765# Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs-Operations Office.
CORROSION OF AUSTENITIC STAINLESS STEEL ALLOYS DUE TO HNO3-HF MIXTURES
H. S. Cole Oct. 1974 47 p refs
(Contract AT(10-1)-1375)
(ICP-1036) Avail: NTIS HC $3.75

A literature survey and results of experimental work on the corrosion of austenitic stainless steel alloys due to HNO3-HF mixtures are presented. Most of the available data obtained during the processing of spent nuclear fuel elements where solutions containing nitrates and fluorides are frequently encountered. Austenitic stainless steels have been extensively used in nitrate-fluoride solution service in these plants. It has been shown that their service may be improved by: (1) proper annealing; (2) stabilizing with niobium or titanium; (3) complexing the solutions the stainless steels are exposed to with aluminum, zirconium, or thorium; (4) utilizing stainless steels which have a low carbon content; (5) maintaining the uncomplexed hydrofluoric acid in the solution at as low a value as practicable; and (6) utilizing neutron absorbing elements in the alloys at concentrations as low as possible for service as fixed nuclear poisons. Other protective measures such as reduced contact time, temperature, concentration, and fluoride-to-nitrate ratio can be employed to minimize corrosion. Author (NSA)

N75-23766# California Univ., Berkeley. Lawrence Berkeley Lab.
STRAIN ENERGY ON DISK SHAPED GP ZONE
J. A. Wert Dec. 1974 36 p refs
(Contract W-7405-eng-48)
(LBL-3174) Avail: NTIS HC $3.75

A simplified form of Khachaturyan's solution to the general problem of determining the strain energy of an arbitrarily shaped coherent inclusion is found for the case of a disk-shaped inclusion. Specific strain energies are calculated as a function of the orientation of such an inclusion in lattices possessing various elastic properties. Some numerical results are presented. The salient features of the specific strain energy surface are found to depend only on the elastic properties of the lattice. A relationship between an elastic anisotropy parameter, A, and the minimum strain energy orientation of a disk-shaped inclusion is observed. The strain energies of GP zones in Al-Cu and Cu-Be age hardening alloys are calculated. The minimum strain energy orientations of GP zones in these alloys are identical with experimentally observed orientations. Author (NSA)

N75-23767# California Univ., Berkeley. Lawrence Berkeley Lab.
EFFECT OF A LONG RANGE INTERATOMIC POTENTIAL ON THE STABILITY OF CRYSTAL LATTICES Ph.D. Thesis
C. W. Krause Sep. 1974 127 p refs
(Contract W-7405-eng-48)
(LBL-3151) Avail: NTIS HC $5.75

The mechanical and phase stability of metallic crystal lattices is studied with a long range interatomic potential that describes the bonding between atoms in the lattice. The long range potential, which oscillates with increasing interatomic separation, can be partially summed to obtain an interplanar interaction that is particularly useful for the study of shear phenomena. Use of the interatomic potential, referred to as the Friedel potential, and the interplanar interaction allow the calculation of the relative energies of competing lattice structures, of phonon dispersion relations, elastic constants, stacking fault energies, and the determination of the effects of finite homogeneous deformations of simple metallic crystals. The various phenomena and structures are studied at constant volume and as a function of the valence of metallic alloy. Author (NSA)

N75-23768# California Univ., Berkeley. Lawrence Berkeley Lab.
ROLE OF DEFORMATION INDUCED PHASE TRANSFORMATIONS IN THE PLASTICITY OF SOME IRON-BASE ALLOYS
V. F. Zackay, M. D. Bhandarkar, and E. R. Parker Aug. 1974 83 p refs Presented at the 21st Sagamore Army Mater. Res. Conf. on Advan. in Deformation Process., Raquette, N. Y., 13 Aug. 1974
(Contract W-7405-eng-48)
(LBL-2775; Conf-740840-2) Avail: NTIS HC $4.75

Microstructural changes are studied in alloys which induce phase transformations. The deformation induced phase transformations which cause unusual changes in the mechanical properties of ferrous and nonferrous alloys are discussed. It is shown that this type of transformation enhances the mechanical properties of high strength austenitic alloys or TRIP steels. Useful combinations of toughness, strength, and ductility are obtained in these steels by control of the composition and processing. TRIP steels are thermomechanically processed in the austenitic state. The several compositional, processing, and testing variables that influence this austenite stability are presented. It is shown that the strength, ductility, stress-strain behavior, fracture toughness, fatigue properties, and corrosion resistance of TRIP steels are strongly affected by austenite stability. NSA

N75-23769# Maryland Univ., College Park. Dept. of Mechanical Engineering.
STUDY OF ALLOY STRENGTHENING DUE TO ATOMIC ORDER Progress Report, 1 May 1974 - 30 Apr. 1975
M. J. Marcinkowski 1975 5 p
(Contract AT(40-1)-3935)
(ORO-3935-43) Avail: NTIS HC $3.25

Research is reported on the application of atomic ordering to the understanding of the mechanical behavior of metals and alloys in general. The study of the behavior of interacting noncoaxial dislocation glide loops is reported. Since dislocations are generally nucleated as loops at random sites within a crystal and eventually expand so as to come into proximity with one another, such interactions are of extreme importance in understanding the work hardening of both ordered as well as disordered alloys. In both classes of materials, the dislocations may meet one another to form dipoles, or else pass one another, or in the case of screw type dislocations, they may cross slip with resultant mutual annihilation. NSA

N75-23770# Institutul de Fizica Atomica, Bucharest (Romania).
COMPUTING PROGRAMME FOR A TWO SUBLATTICE NEEL FERRIMAGNET, APPLICATION TO THE RAREEARTH COMPOUNDS
D. P. Lazar and E. Burzo 1974 15 p refs
(IFA-SR-9-1974) Avail: ERDA Depository Libraries HC $4.00

Two FORTRAN programs used for establishing the validity of the neel model of the ferrimagnetic metallic systems are described. Results obtained using these programs in calculations on ferrimagnetic rare-earth systems are included. NSA

N75-23771# Danish Atomic Energy Commission, Risoe.
METALLURGY DEPARTMENT Progress Report, 1 Jan. - 31 Dec. 1973
Jun. 1974 51 p refs
(RISO-304) Avail: ERDA Depository Libraries HC $5.75

Research progress is reported on properties of single-phase and two-phase materials, zirconium alloys, fuel elements, radiation effects on stainless steels, automatic tube inspection, and international programs. NSA

N75-23772# Danish Atomic Energy Commission, Risoe.
EXCITATIONS AND MAGNETIC PROPERTIES OF RARE-EARTH Al2 COMPOUNDS Ph.D. Thesis - Tech. Univ., Lyngby, Denmark
Per Bak Jul. 1974 64 p refs
(RISO-312) Avail: ERDA Depository Libraries HC $6.25

Magnetic excitation spectra, measured by inelastic neutron scattering, and single-crystal magnetization curves of rare-earth Al2 compounds were analyzed using a Hamiltonian including fourth and sixth order crystals field terms and an isotropic exchange interaction between the magnetic ions. Excitons are described as transitions between single-ion atomic levels propagating through the lattice via the exchange interaction. In NdAl2 dispersion relations of excited mean-field states are described. A double-peak structure in the neutron spectrum of TbAl2 is interpreted as a magnon-exciton interaction. A Green's function theory was evaluated and a detailed microscopic description of

the magnetic anisotropy of NdAl2, PrAl2, TbAl2, and ErAl2 is given. The effective charge distribution around the magnetic ion is shown to be independent of the particular rare earth constituent. Author (NSA)

N75-23773# Aeronautical Quality Assurance Directorate, Uxbridge (England).

AN INVESTIGATION OF THE EFFECT OF SHOT PEENING ON THE ROTATING BENDING FATIGUE ENDURANCE OF CHROMIUM PLATED 18% Ni MARAGING STEEL

G. H. Chapman [1974] 14 p refs

(AQD/U-000667; BR42666) Avail: NTIS HC $3.25

A range of shot peening intensities was investigated within which satisfactory fatigue strength may be achieved for chromium plated 18% Ni maraging steel. The requirement for shot peening of hard chromium plating is based on Defense specifications. Rotating bending fatigue tests show that satisfactory restoration of fatigue strength may be achieved by shot peening to an intensity within the range 0.010 - 0.015 a2. Peening in excess of 0.015 A2 may result in loss of fatigue strength. ESRO

N75-23774# Lehigh Univ., Bethlehem, Pa.

FRACTURE TOUGHNESS OF BRIDGE STEELS, PHASE 2 REPORT Final Report

R. Roberts, G. R. Irwin, G. V. Krishna, and B. T. Yen Sep. 1974 418 p refs

(Contract DOT-FH-7664)

(PB-239188/6; FHWA-RD-74-59) Avail: NTIS HC $10.50 CSCL 11F

The ability of steel highway bridges to withstand brittle fracture was investigated. The static fracture, toughness, dynamic fracture toughness, the dynamic tear energy, and the Charpy impact properties CVN of steels common to bridge construction were measured over a temperature range of -200OF to +75F. The use of these measures of fracture toughness and fracture mechanics were discussed as they apply to design, inspection, and fabrication of bridges. The present AASHTO CVN requirements for bridge steels were evaluated and judged adequate for structures where parallel load paths exist. GRA

N75-23775# Reynolds Metals Co., Richmond, Va. Metallurgical Research Div.

PROGRAM TO IMPROVE THE FRACTURE TOUGHNESS AND FATIGUE RESISTANCE OF ALUMINUM SHEET AND PLATE FOR AIRCRAFT APPLICATIONS, VOLUME 2 Final Report, 1 Mar. - 1 Jul. 1974

David S. Thompson and Robert E. Zinkham Sep. 1974 82 p refs

(Contract F33615-74-C-5060; AF Proj. 7351)

(AD-A003417; AFML-TR-73-247-Vol-2) Avail: NTIS CSCL 11/6

The fatigue crack growth rate (FCGR) characteristics of a 7000 series and a 2000 series alloy were evaluated. The bulk of the work was carried out on thermomechanically aged (TMA) RX725 (Al-6Zn-2.5Mg-1.5Cu-.1 Zr) and 2048 in the TMA and -T3E9 tempers respectively. Crack growth rate was reduced by either crack branching or deviation of the crack from the plane normal to the applied stress. Both experimental materials were found to be sensitive to environment (high or low humidity) even though they were resistant to exfoliation corrosion. An inverse hyperbolic tangent model fitted the data well, but the parameters in the model did not lend themselves to characterizing FCGR material performance. It was concluded that significant benefits could be achieved by TMA processing. GRA

N75-23776# Boeing Aerospace Co., Seattle, Wash.

FRACTURE AND FATIGUE CRACK GROWTH BEHAVIOR OF SURFACE FLAWS AND FLAWS ORIGINATING AT FASTENER HOLES. VOLUME 2: TABULATED DATA Final Report, Jun. 1972 - Sep. 1973

L. R. Hall, R. C. Shah, and W. L. Engstrom May 1974 324 p

(Contract F33615-72-C-1740; AF Proj. 486U)

(AD-A003416; AFFDL-TR-74-47-Vol-2) Avail: NTIS CSCL 11/6

The report contains tabulations of raw fatigue crack growth rate data generated during tests of surface flaws and flaws originating at fastener holes. The surface flaw tests involved a number of variables including alloy, flaw shape, initial flaw depth, loading profile, and stress ratio. Three alloys were tested including 2219-T851 aluminum, 9Ni-4Co-0.2C steel (190- 210 ksi), and 6Al-4V standard ELI beta annealed titanium, all in plate form. Most specimens contained two or three flaws having initial depth-to-length ratios of 0.15, 0.30, or 0.45, and initial depth-to-thickness ratios ranging from 20 to 80 percent of the specimen thickness. Three different loading profiles were investigated including constant cyclic load, periodic overload, and spectrum loadings. GRA

N75-23777# Naval Electronics Lab. Center, San Diego, Calif.

ALUMINUM RIBBON AND ROUND WIRE BONDING: COMPARATIVE ANALYSIS Research and Development Report, Jan. 1973 - Apr. 1974

R. F. Unger 5 Mar. 1975 95 p refs

(AD-A007513; NELC-TR-1946) Avail: NTIS CSCL 09/1

Results are reported of an experimental program conducted to determine the benefits and problems involved in implementing ribbon wire bonding processes and techniques, and to establish the feasibility of converting from the conventional round-wire to ribbon ultrasonic bonding. GRA

N75-23778# Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy and Materials Science.

CRITICAL POTENTIALS FOR STRESS CORROSION CRACKING (MECHANISM OF STRESS CORROSION CRACKING) Final Report, 1 May 1973 - 30 Apr. 1975

H. H. Uhlig 1 Feb. 1975 71 p refs

(Contracts DAHC04-73-C-0023; DAHC04-74-C-0026)

(AD-A007273; ARO-11266-4-MC) Avail: NTIS CSCL 11/6

This report encompasses studies on (1) stress corrosion cracking behavior of mild steel in ammonium carbonate solutions; (2) of high strength steels in water, 3% sodium chloride, 3% sodium sulfate and 3% sodium nitrate solutions. Emphasis was placed on measuring critical potentials below which failures do not occur. The availability of these potentials made it possible to assess and to predict useful galvanic couples for the prevention of stress corrosion failures. GRA

N75-23779# Georgia Inst. of Tech., Atlanta.

COMPLEX METAL HYDRIDES: HIGH ENERGY FUEL COMPONENTS FOR SOLID PROPELLANT ROCKET MOTORS Annual Report, 1 Jan. - 31 Dec. 1974

Eugene C. Ashby 31 Dec. 1974 185 p refs

(Contract N00014-67-A-0159-0005; NR Proj. 093-050)

(AD-A007353) Avail: NTIS CSCL 07/2

During the contract period work has continued on the preparation and structure elucidation of simple and complex metal hydrides of the main group elements. The new hydrides Mg(ZnH3)2 and MgZnH4 are reported for the first time as well as new and simple routes for the preparation of complex metal hydrides of beryllium; e.g. Li2BeH4 and Li3BeH5. GRA

N75-23780# California Univ., Berkeley. Dept. of Materials Science and Engineering.

THE EFFECT OF GRAIN SIZE AND RETAINED AUSTENITE ON THE DUCTILE-BRITTLE TRANSITION OF A TITANIUM-GETTERED IRON ALLOY

S. Jin, S. K. Hwang, and J. W. Morris, Jr. Jan. 1975 22 p refs

(Contract N00014-69-A-0200-1062; NR Proj. 031-762)

(AD-A007360; TR-6) Avail: NTIS CSCL 11/6

The effect of microstructural changes on the ductile-brittle transition temperature (DBTT) was studied in a titanium-gettered Fe-8Ni-2Mn-0.15Ti alloy. A fairly strong grain size dependence of the transition temperature was found. Grain size refinement from approximately 38 micrometers (ASTM No. 6.5) to approximately 1.5 micrometers (ASTM No. 15.5) through a four-step thermal treatment lowered the transition temperature by approximately 162C. A small amount of retained austenite was introduced to this grain-refined microstructure, and the transition temperature was suppressed by an additional 100 approximately 150C. The suppression of the DBTT due to retained austenite was smaller when introduced into a large grained structure (approximately 64C). The distribution and stability of retained austenite were also studied. GRA

N75-23781# National Bureau of Standards, Washington, D.C. Diffusion in Metals Data Center.
THEORY OF THE HIGH TEMPERATURE GAS CORROSION OF METALS BENEATH COATINGS
G. I. Zhuravlev, A. I. Avgustinik, and A. A. Borisenko 1974 24 p refs Transl. into ENGLISH from the book "Zharostoikie Teplostoikie Pokrytiya, Tr. Vses. Soveshch.," 4th USSR, 1969 p 35-56 Sponsored in part by NSF
(TT-74-58010; DMDC-14091) Avail: NTIS HC $3.25 CSCL 11F

Enamel coatings were baked on copper and titanium substrates and then oxidized in air at temperatures ranging from 600 to 850C. Weight gain measurements were taken and supplemented by metallographic examination. Diffusion coefficients were calculated and the results related to a proposed theory of the oxidation process. GRA

N75-23782# National Materials Advisory Board, Washington, D.C.
CHARACTERISTICS OF HY-180 AND TI-100 FOR WELDED HIGH STRENGTH STRUCTURES Final Report
Dec. 1974 91 p refs
(Contract MDA903-74-C-0167)
(AD-A006758; NMAB-310) Avail: NTIS CSCL 11/6

The present state of the art and future developments necessary for successful commercial application of high-strength materials in welded structures are reported. The 10Ni-8Co-2Cr-1Mo steel and the Ti-6Al-2Cb-1Ta-0.8Mo titanium alloy were selected as candidate materials on the basis of their outstanding fracture-resistance characteristics and their roughly equivalent strength-to-weight ratios. The availability chemical composition, physical, and mechanical properties and heat treatment and metallurgical characteristics of both candidate materials are summarized. A general review of the problems and potential of the various welding processes is included and those processes that show greatest promise and should be further developed are identified. The available information on the mechanical properties of state-of-the-art welds (made for the most part under laboratory conditions) also is discussed. GRA

N75-23783# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ULTRASONIC PRESSURE WORKING OF METALS, CHAPTERS 2 AND 5
V. P. Severdenko, V. V. Klubovich, and A. V. Stepanenko 23 Jan. 1975 110 p refs Transl. into ENGLISH from the book "Obrabotka Metallov Davleviem s Ultrazvukom" Minsk, 1973 p 45-76, 177-233
(AD-A007695; FTD-HC-23-1855-74) Avail: NTIS HC $5.25 CSCL 13/8

The effect of ultrasound on the plastic deformation process was investigated. The pressing of metals and alloys with the application of ultrasound is discussed along with mechanical properties, mechanical working, and lubrication. M.J.S.

N75-24656 Joint Publications Research Service, Arlington, Va.
NEW TECHNOLOGIES IN METALLURGY STUDIED BY RESEARCH INSTITUTE
Nikolay Stanev *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 2-4 Transl. into ENGLISH from Rabotnichesko Delo (Sofia), 15 Apr. 1975 p 4
(For availability see N75-24655 15-99)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-23784 Brown Univ., Providence, R.I.
NUCLEAR MAGNETIC RESONANCE STUDIES OF GLASSES AND RELATED CRYSTALLINE MATERIALS Ph.D. Thesis
Kyo Sool Kim 1974 102 p
Avail: Univ. Microfilms Order No. 75-9190

Nuclear magnetic resonance techniques were employed to study the environments of boron and lead atoms as a function composition in the following series of glasses: Ag_2O-B_2O_3, PbO-B_2O_3-SiO_2, and MgO-Na_2O-B_2O_3. In addition, two compounds which appear in the Ag_2O-B_2O_3 system and several commercially obtained compounds which contain lead atoms were studied in an effort to determine the relationship between the structure of glasses and related crystalline compounds. The B-11 NMR was used to study the structure of glasses and crystalline compounds in Ag_2O-B_2O_3 and the MgO-Na_2O-B_2O_3 systems. The fraction N4 of boron atoms in BO_4 units was analyzed according to a method developed for this system. The structure of glasses in the system PbO-B_2O_3-SiO_2 was studied by B-11 and Pb-207 NMR spectra. Dissert. Abstr.

N75-23785 North Carolina State Univ., Raleigh.
CHARACTERIZATION OF NYLON 66-POLY(ETHYLENE GLYCOL) BLEND FIBERS Ph.D. Thesis
Gulgunji Ramachandra Bhat 1974 249 p
Avail: Univ. Microfilms Order No. 75-10391

The influence of poly(ethylene glycol) inclusions on the properties of nylon 66 fibers was investigated. Photomicrographs, wide-angle X-ray diffraction patterns and infrared spectra of a series of nylon 66 fibers containing various amounts of poly (ethylene glycol) additive showed that the two polymers are mutually incompatible and form truly heterogeneous mixtures. Some possible interaction between the two polymers, however, was suggested by the melting characteristics of the fibers in a differential scanning calorimeter. Results suggest that the inclusions do not share externally applied stresses. Chemical analysis of fiber composition showed that poly(ethylene glycol) was not lost by volatilization during spinning of the fibers. Dissert. Abstr.

N75-23786 Utah Univ., Salt Lake City.
MOLECULAR MECHANICS OF POLYMERS BY DYNAMIC INFRARED TECHNIQUES Ph.D. Thesis
Richard Patrick Wool 1974 230 p
Avail: Univ. Microfilms Order No. 75-11518

The mechanisms underlying the phenomenon of vibrational frequency shifting in stressed polymers were investigated. It was discovered that mechanisms involving geometric or conformational changes of molecular structure coupled with the reduction of force constants associated with molecular bonds and angles were the major contributors to frequency shifts in the infrared spectrum. New dynamic infrared techniques were developed to investigate the effect of macroscopic deformation on molecular stress distributions, orientation changes, conformational variations, bond rupture processes and the orientation distribution of bonds. These methods were then applied to investigate the molecular mechanics of highly oriented viscoelastic polypropylene during stress relaxation and creep. A mechano-chemical viscoelastic model was developed based on chain length distributions and linear viscoelasticity. Calculated intensities and frequency variations based on this model agreed well with the observed spectra. The molecular mechanics of stress relaxation and creep were shown to be opposite in behavior in most respects. Dissert. Abstr.

N75-23787*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE GALVANOMAGNETIC PROPERTIES OF GRAPHITE IN MAGNETIC FIELDS UP TO 500 kOe AT LOW TEMPERATURES
N. B. Brandt, G. A. Kapustin, V. G. Karavayev, A. S. Kotosonov, and Ye. A. Svistova Washington NASA Jun. 1975 19 p refs Transl. into ENGLISH from Zh. Eksperim. i Teor. Fiz. (USSR), v. 67, no. 3(9), 1974 p 1136-1147
(Contract NASw-2481)
(NASA-TT-F-16387) Avail: NTIS HC $3.25 CSCL 08G

The Hall coefficient and electrical resistance in graphite were measured in magnetic fields up to 500 kOe at 4.2 K. It is shown that due to the smallness of the Hall angle, the Hall coefficient cannot be used to explain the galvanomagnetic properties or to calculate the kinetic coefficients of graphite. Measurements in fields up to 200 Oe show that high mobility electrons are the minority carriers in the samples investigated. The concentrations and mobilities of the majority and minority carriers were calculated on the basis of the three-band model with a computer. A sharp drop in the electron and hole decompensation is observed in magnetic fields between 300 and

500 kOe which may be ascribed to magnetic freezing of the impurity carriers. Author

N75-23788# Los Alamos Scientific Lab., N.Mex.
NEUTRON DIFFRACTION STUDIES OF DEUTERIUM SOLID STRUCTURES AND TRANSITIONS
J. L. Yarnell, R. L. Mills, and A. F. Schuch 1974 22 p refs Presented at Intern. Conf. on Quantum Crystals, Tbilisi, USSR, 11-15 Nov. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1716; Conf-741136-1) Avail: NTIS HC $3.25

Fine-grained, randomly oriented samples of solid D2 were prepared by injecting D2 gas into liquid He at 4 K. In all cases, the as-frozen solid was predominatly face-centered cubic crystals with approximately 10 percent of the material in the hexagonal closed-pack (hcp) form expected at 4 K. Upon annealing at approximately 12 K, all samples transformed to pure hcp, and remained hcp when returned to 4 deg K. The transition is martensitic. Analysis of the data, using cross-correlation techniques, revealed the presence of very weak, mixed-index peaks characteristics of the ordered Pa3 structure. Evidence of stacking faults was seen for all structures. Author (NSA)

N75-23789# California Univ., Berkeley. Lawrence Berkeley Lab.
PROBABILISTIC APPROACH TO PLASTICITY IN POLYCRYSTALLINE MATERIALS USING DISLOCATION MECHANICS Ph.D. Thesis
S. J. Sackett 8 Nov. 1974 93 p refs
(Contract W-7405-eng-48)
(LBL-3384) Avail: NTIS HC $4.75

A set of constitutive equations for polycrystalline plasticity that is fully consistent with thermodynamic requirements is derived. The idea of randomly distributed glide plane orientations and Burger's vector directions is introduced to facilitate handling of the polycrystalline structure. This yields equations involving probability distributions for variables that are directly related to measurable dislocation quantities. When the motion of the dislocations is isochoric, the tensorial character of the plastic strain rate is shown to be entirely determined by a second rank symmetric tensor directly related to ordinary elements of crystallographic glide. This same tensor is also shown to determine to shear stress acting on a dislocation. Characteristic yield conditions are calculated for several sample materials in which the dependence of the dislocation velocity on stress is given by an empirical power function. NSA

N75-23790# Brookhaven National Lab., Upton, N.Y.
ABSORPTION AND LUMINESCENCE OF GLASSES DURING ELECTRON IRRADIATION
K. J. Swyler, W. H. Hardy, II, and P. W. Levy 1975 10 p Presented at a Topical Meeting on Optical Fiber Transmission, Williamsburg, Va., 7 Jan. 1975 Sponsored by ERDA
(BNL-19348; Conf-750102-2) Avail: NTIS HC $3.25

Absorption spectrum, growth and decay curves, and luminescence emission measurements have been made on NBS 710 and 711, and AO-'C' glass during and after 1.5 MeV electron irradiation. Author (NSA)

N75-23791# Army Materials and Mechanics Research Center, Watertown, Mass.
SILICON NITRIDE FOR STRUCTURAL APPLICATIONS: AN ANNOTATED BIBLIOGRAPHY Final Report
Donald R. Messier and Margaret M. Murphy Feb. 1975 86 p refs
(ARPA Order 1849)
(AD-A007270; AMMRC-MS-75-1) Avail: NTIS CSCL 11/2

An annotated bibliography is presented of the work reported in the literature (1961-1974) on the fabrication and properties of reaction sintered and hot pressed silicon nitride. Also included is work on silicon oxynitride and Si-M type oxynitrides having the silicon nitride structure. Whisker growth, chemical reactions, mechanical behavior, and other related topics relevant to the processing and applications of silicon nitride are also included. Although the requirements for increasingly higher operating temperatures (2500F) for gas turbines have created much of the interest in silicon nitride, there are other potential high temperature applications such as bearings and radomes for which silicon nitride is also under consideration. GRA

N75-23792# North Carolina State Univ., Raleigh. Engineering Research Services Div.
OPTIMAL DENSIFICATION OF CERAMICS BY RATE CONTROLLED SINTERING Final Report, 1 Nov. 1972 - 31 Jan. 1974
Hayne Palmour, III, Thomas M. Hare, and M. L. Huckabee Mar. 1974 162 p refs
(Contract N00019-73-C-0139)
(AD-A007339) Avail: NTIS CSCL 11/2

The rate controlled sintering behavior of approximately 99.9% Al2O3 has been studied in comparison with conventional firing methods. Several lots of (a) chemically prepared and (b) superground aluminas (with and without MgO doping) were carefully characterized by transmission electron microscopy, spectrochemical, X-ray, sedimentation and residual gas analyses, surface area determinations and dynamic differential calorimetry. Process steps which preceded firing exerted important influences upon densities, microstructures and strength levels attained after densification by conventional or rate controlled sintering regimes. Investigations and sequential optimizations of a number of process steps, including milling, binder addition, remilling, granulation, dry pressing, and binder burnout are described. Under rate control, grain growth in the intermediate sintering range was found to be a function only of fractional density. GRA

N75-23793# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
STRENGTH DEGRADATION OF BRITTLE SURFACES: BLUNT INDENTERS Interim Report
B. R. Lawn, S. M. Wiederhorn, and H. H. Johnson Feb. 1975 35 p refs
(Contract NAonr-4-75; NBS Proj. 3130453)
(AD-A007447; NBSIR-75-664) Avail: NTIS CSCL 11/2

Indentation fracture mechanics is used to develop a theoretical basis for pre-determining the strength properties of brittle surfaces in prospective contact situations. Indenters are classified as blunt or sharp, of which only the first is considered in the present work. The classical Hertzian cone crack conveniently models the fracture damage incurred by the surface in this class of indentation event. Bend tests on abraded glass slabs confirm the essential features of the theoretical predictions. The role of controlling variables in the degradation process, notably starting flaw size and indenter radius, is systematically investigated. An indication is also given as to optimization of material parameters. The analysis leads to some novel suggestions concerning surface preparation procedures that might be followed in order to minimize strength losses. GRA

N75-23794# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
ELECTRON MICROSCOPIC OBSERVATIONS OF MICROCRACKING ABOUT INDENTATIONS IN ALUMINUM OXIDE AND SILICON CARBIDE Interim Report
B. J. Hockey and B. R. Lawn Jan. 1975 34 p refs
(Contract NAonr-4-75; NBS Proj. 3130453)
(AD-A007445; NBSIR-75-658) Avail: NTIS CSCL 11/2

Transmission electron microscopy was used to examine the nature of microcracking about small-scale indentations in two highly brittle solids, sapphire and carborundum. The observed crack geometry is discussed in terms of an earlier model of indentation fracture beneath a point force, in which both loading and unloading half-cycles contribute to the crack growth. The residual interfaces are characterized mainly by moire patterns, sometimes by dislocation networks. These observations are discussed in relation to spontaneous closure and healing mechanisms, and the lattice mismatch necessary for their production estimated at about one part in a thousand. It is shown that cleavage steps comprise the main source of obstruction to lattice restoration across the interfaces. Mechanical and thermal treatments of the indented surfaces are found to influence the extent of the residual cracking. Some practical implications of the observations are discussed. GRA

N75-23795# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INFLUENCE OF A STRONG STATIC ELECTRICAL FIELD ON THE ABSORPTION SPECTRUM OF MYLAR POLYESTER

F. Kerherve and G. Mayer 3 Mar. 1975 8 p refs Transl. into ENGLISH from Optics Commun. (Netherlands), v. 9, no. 3, Nov. 1973 p 291-293

(AD-A007864; FTD-HC-23-0969-75) Avail: NTIS CSCL 20/12

Electrical fields induce a shift towards lower frequencies of the absorption spectrum of mylar. This shift, proportional to the square of the field, is three orders of magnitude smaller than a typical Franz-Keldysh effect and is sensitive to the relative orientation of the static field with respect to the polarization vector of the light. It is a suggested that the measured shift is mostly due to Stark effects in this amorphous material. This kind of measurement could be used to estimate the degree of crystalline order in partially amorphous solids. GRA

N75-23796# Princeton Univ., N.J. Dept. of Chemical Engineering.

CONCERNING THE NATURE OF RUBBER GLASS: TRANSITION OF ELASTOMERIC MATERIALS Final Report

Garth L. Wilkes Mar. 1975 8 p

(Contract N00014-67-A-0151-0011; NR Proj. 056-377)

(AD-A007348; TR-140) Avail: NTIS CSCL 20/12

The report summarizes the work carried out by the late Prof. A. V. Tobolsky under the sponsorship of the Office of Naval Research. This period covered 1967-1975. A complete list of publications from this research is provided. Under this same sponsorship, a memorial conference was held to the late Prof. A. V. Tobolsky. This report also provides the text of papers presented at this event. GRA

N75-23797# Research Triangle Inst., Durham, N.C. Camille Dreyfus Lab.

A STUDY OF GLOW DISCHARGE POLYMERIZATION AS A MEANS OF MODIFYING THE SURFACE OF POLYMERS

H. Yasuda 10 Jan. 1975 57 p refs

(Contract N01-HB-3-2913)

(PB-239289/2) Avail: NTIS HC $4.25 CSCL 07C

The modification of surfaces to improve blood compatibility by glow-discharge treatment and by glow-discharge polymerization in order to lay down an ultrathin layer of coating was investigated. Mechanisms of polymer formation in glow discharge, as well as the formation of free radicals in glow-discharge polymers and in the surfaces which are treated with non-polymer-forming glow discharge, such as of argon and nitrogen, were studied. Glow-discharge polymers of hexamethyldisiloxane and of acetylene-N2H-2O are found to produce promising blood-compatible surfaces, according to in vivo tests carried out to date. Statistical evaluations of glow-discharge polymer surfaces by in vitro blood clotting time indicate that the reproducibility of preparation of surfaces by the polymerization is excellent. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-23798 Illinois Univ., Chicago.

AS ASYMPTOTIC IGNITION THEORY OF POROUS SOLID FUELS (THERMO-DIFFUSIVE THEORY) Ph.D. Thesis

Choong Se Kim 1974 121 p

Avail: Univ. Microfilms Order No. 75-10431

The governing equations of thermal ignition for porous solid fuel, such as coal, were analyzed using two-dimensional axisymmetric geometries by the Laplace asymptotic method. The nonlinear partial differential equations of energy and mass balances in time-space coordinates containing the Arrhenius volumic chemical reaction terms are analyzed. The Laplace asymptotic technique is applied in evaluating certain nonlinear integrals involving the exothermic chemical reaction terms approximately but in closed forms. A detailed discussion of the effects of the governing parameters on ignition is presented. Because of the basically closed-form nature of the solutions obtained, many general and fundamental aspects of the ignition criteria previously unknown are found. Dissert. Abstr.

N75-23799 Iowa State Univ. of Science and Technology, Ames.

AN ANALYSIS OF DROPLET SIZE DISTRIBUTION DURING MONOPROPELLANT SPRAY COMBUSTION Ph.D. Thesis

James David Kearns 1974 160 p

Avail: Univ. Microfilms Order No. 75-10485

A well-stirred reactor model was used to analyze droplet size distribution during steady-state monopropellant spray combustion. The model is used to elucidate the changes that occur in droplet size distribution as an injected spray distribution enters the stirred portion of a combustion chamber. An example of a hydrazine spray resulting from an impingement atomizer passing through a well-stirred region followed by a convergent nozzle in one-dimensional flow is mathematically investigated. The results show complete combustion is inhibited by the presence of a few large droplets. Longer combustion times must be made available to eliminate large droplets which combust at a slower rate. Complete combustion is enhanced by increasing the combustion chamber size or the mixing, decreasing the number of large droplets initially injected or the injection rate, or by increasing the combustion chamber temperature. Dissert. Abstr.

N75-23800# Aerojet Solid Propulsion Co., Sacramento, Calif.

NON-LINEAR FRACTURE MECHANICS: NEW THEORIES OF SOLID PROPELLANT RESPONSE AND FRACTURE BEHAVIORS Final Report, 1 Jul. 1972 - 30 Jun. 1974

Kenneth W. Bills, Jr. and Paul J. Blatz Feb. 1975 142 p refs Prepared in cooperation with Shock Hydrodynamics, Inc.

(Contract N00123-72-C-2293)

(AD-A007334; ASPC-1987-26F; NWC-TP-5684) Avail: NTIS CSCL 21/9

Non-linear fracture mechanics is a newly developing analytical method for the treatment of fracture behaviors in composite solid propellants. The work presented here was designed to show the need for these concepts and the material behaviors that must be taken into account by the theory. An empirically derived relation forms the fundamental point of departure for the non-linear fracture criterion. In addition, a non-linear strain energy function was investigated as the initial effort in developing the required analytical relations. GRA

N75-23801# Department of Defense Explosives Safety Board, Washington, D.C.

MINUTES OF THE 16TH EXPLOSIVES SAFETY SEMINAR, VOLUME 1

26 Sep. 1974 779 p refs Seminar held at Hollywood, Fla., 24-26 Sep. 1974 Vol 2

(AD-A007557) Avail: NTIS CSCL 19/1

The document presents discussions and papers reviewed at a seminar on hazards relative to handling, storing, and transporting explosive materials. GRA

N75-23802# Department of Defense Explosives Safety Board, Washington, D.C.

MINUTES OF THE 16TH EXPLOSIVES SAFETY SEMINAR, VOLUME 2

26 Sep. 1974 764 p refs Seminar held at Hollywood, Fla., 24-26 Sep. 1974 Vol. 2

(AD-A007566) Avail: NTIS CSCL 19/1

For abstract see, N75-23801.

N75-23803# Ballistic Research Labs., Aberdeen Proving Ground, Md.

IGNITION OF MILITARY FUELS BY HOT PARTICLES

Anthony E. Finnerty and Howard J. Schuckler Mar. 1975 41 p refs

(AD-A007728; BRL-MR-2442) Avail: NTIS CSCL 21/2

An investigation has been conducted on the ignition of liquid hydrocarbon fuels of military interest by non-reactive heated particles. Minimum ignition temperatures of different size ignition sources have been determined for various fuels. An activation energy for ignition of diesel fuel by heated particles

has been determined. Ignitions have been studied at fuel temperatures from -78C to over 200C. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-23804# Institut Franco-Allemand de Recherches, St. Louis (France).
SELECTED CONTRIBUTIONS TO HIGH-SPEED PHYSICS
Bonn Bundesmin. fuer Verteidigung 1974 66 p refs In GERMAN; ENGLISH summaries Sponsored by Bundesmin. fuer Verteidigung
(BMVG-FBWT-74-8) Avail: NTIS HC $4.25; Bundeswehramt 30 DM

Topics covered are: Mechanical-electrical energy conversion in ferroelectric ceramics, mode locked solid state lasers for photographic investigation of transient phenomena, optimization of dye lasers, and pulsed CO2 lasers. For individual titles, see N75-23805 through N75-23808.

N75-23805 Institut Franco-Allemand de Recherches, St. Louis (France).
NONLINEAR CONVERSION OF FERROELECTRIC ENERGY AND ENERGY CONVERSION BY FORCED TRANSITION WITH Pb(Zr SUB (1-x)Ti SUB x)O3 CERAMICS [NICHTLINEARE UMWANDLUNG FERROELEKTRISCHER ENERGIE UND ENERGIE-UMWANDLUNG DURCH ERZWUNGENEN UEBERGANG MIT Pb(ZrSUB1-xTiSUBx)O3-KERAMIKEN] c76
Francois Bauer *In its* Selected Contrib. to High-Speed Phys. 1974 p 3-21 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

Two methods of mechanical-electrical conversion of the energy of ferroelectric poled ceramics of the Pb(2r sub (1-x) Ti sub (x)O3 type are reported. The first method is the nonlinear energy conversion technique, whereas the second one consists in converting energy by the forced transition from the ferroelectric to the antiferroelectric state. Experimental findings achieved in the past are analyzed with the aid of Berlincourt diagrams and simultaneously completed by a straightforward calculation based on Gibbs' conservation of energy law for ferroelectric materials with transition from the ferroelectric to antiferroelectric state, pressure thereby being involved. The experimental investigation of the adiabatic depolarization of materials of the Pb(zr sub (1-x) Ti sub (+)O3 type undergoing the action of a shock confirms some of the established criteria. The maximum energies found are 1.4 J/cu cm. They are obtained by the forced transition from the metastable ferroelectric to the antiferroelectric state of hardened materials. Author (ESRO)

N75-23806 Institut Franco-Allemand de Recherches, St. Louis (France).
APPLICATION OF MODE LOCKED SOLID STATE LASERS TO PHOTOGRAPHIC INVESTIGATION OF TRANSIENT PHENOMENA [ANWENDUNG MODENGEKOPPELTER FESTKOERPERLASER ZUR PHOTOGRAPHISCHEN UNTERSUCHUNG SCHNELL ABLAUFENDER VORGAENGE] c36
Guenter Gulitz *In its* Selected Contrib. to High-Speed Phys. 1974 p 23-34 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

A mode locked solid state laser is used as an ultrarapid light source for taking photographs of transient phenomena. The investigation was made at the wavelengths of a neodymium and ruby laser (1060 nm, 697 nm). The extraction of the single pulses is operated inside and outside the cavity. Photographs are shown which were taken with the whole pulse train or with single pulses. The half widths of the laser pulses are ranging from 20 to 30 psec. Schlieren pictures prove the intensity of the pulse train to be sufficient for direct exposure of the photographic material. An additional amplifier is used in the case of single pulse operation. Author (ESRO)

N75-23807 Institut Franco-Allemand de Recherches, St. Louis (France).
OUTPUT ENERGY OPTIMIZATION OF A DYE LASER [OPTIMIERUNG EINES FARBSTOFFLASERS BEZUEGLICH DER AUSGANGSENERGIE] c36
Antoine Hirth *In its* Selected Contrib. to High-Speed Phys. 1974 p 35-47 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

The efficiency of the Rhodamine 6C dye laser is theoretically investigated in the special case of intense flashlamp excitation. A serious limitation of the energy and of the pulse repetition rate of dye lasers pumped with coaxial flashlamps is given by the ultrasonic wave initiated by the electric discharge and which propagates through the dye cell during laser emission. Author (ESRO)

N75-23808 Institut Franco-Allemand de Recherches, St. Louis (France).
STUDY AND APPLICATION OF PULSED CO2 LASERS [UNTERSUCHUNG UND ANWENDUNG GEPULSTER CO2-LASER] c36
Manfred Hugenschmidt *In its* Selected Contrib. to High-Speed Phys. 1974 p 49-65 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

Peak power of pulsed CO2 lasers was considerably increased using transverse excitation at atmospheric pressure (TEA). Two arrangements are described in which the excitation of the vibrational and rotational states is achieved by means of electric discharges. These lasers can be applied in the field of high speed and plasma physics. Another type of laser is based on an excitation achieved by means of an electron beam injected into the discharge volume through a window of a few microns. The influence of gas composition, window dimension, and accelerating voltage on the energy emitted is investigated. Author (ESRO)

N75-23809# California Univ., Livermore. Lawrence Livermore Lab.
SMOKE HAZARDS FROM BURNING PLASTICS
J. R. Gaskill 5 Nov. 1974 16 p refs Presented at Educational Services Meeting on Plastics and Fire Problem, El Segundo, Calif., 5 Dec. 1974 Sponsored by ERDA
(UCRL-76015; Conf-741223-1) Avail: NTIS HC $3.25

Smoke hazards to people and property from unwanted fires have attracted increasing attention. The use of plastics in construction, furnishings, clothing, and recreational and transportation equipment has increased. Actual fire experiences indicate that organic materials, whether natural or man-made, will burn; those with large surface areas such as films, fabrics, or foams will ignite readily and burn rapidly. Addition of fire retardants to the plastic structure will inhibit ignition, surface flame spread, and combustion products with undersirable properties. Among these are increased smoke density and carbon monoxide production. Studies indicate that certain fire retardant plastic combinations yield very toxic products when exposed to heat such as might be encountered in a fire. Therefore, smoke from fire in a confined space involving these fire-retarded systems must be regarded as quite hazardous if smoke is defined in a larger sense than from the historical viewpoint. Author (NSA)

N75-23810# Nederlands Scheeps-Studiecentrum TNO, Delft. Scheepsbouw Afdeling.
WAVE INDUCED MOTIONS AND LOADS ON SHIPS IN OBLIQUE WAVES
R. Wahab (Inst. TNO for Mech. Construct.) and J. H. Vink May 1975 40 p refs
(Rept-193-S; TDCK-65496) Avail: NTIS HC $3.75; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

Procedures for the calculation of ship motions and sea loads on ship proceeding in oblique regular waves with six degrees of freedom are given. The results, compared with results of model experiments for two ships, seem to be satisfactory for the lower frequencies of encounter, i.e. for the larger wave lengths. Correlation for the higher frequencies was not possible because the model results were not yet available. ESRO

N75-23811# Transportation Systems Center, Cambridge, Mass.
LUBRICATING OIL BURN-OFF IN COAST GUARD POWER PLANTS
J. R. Hobbs and R. A. Walter Feb. 1975 95 p refs Sponsored by Coast Guard

(AD-A007313; TSC-USCG-74-6; USCG-D-80-75) Avail: NTIS CSCL 13/2

The results of a feasibility study for the burn-off of waste oils in Coast Guard power plants are presented. Among the factors considered in this evaluation were: simplicity, cost, engine manufacturers, recommendations, mixing ratios, engine emissions, and effects on engine performance. Combustion in diesel engine, boilers, and gas turbines was investigated. As a result of this study it is recommended that waste oil be treated by procedures outlined in this study, blended at a mix ratio of 1% or less waste oil to diesel fuel oil, and burned off in Coast Guard power plants. GRA

N75-23812# Naval Undersea Center, San Diego, Calif.
OCEAN ENGINEERING Research and Development Report, Jan. 1972 - Jan. 1975
Jan. 1975 138 p refs Revised Prepared in cooperation with ARPA, Arlington, Va., and AEC, Washington, D. C.
(AD-A007297; NUC-TP-278-Rev-1) Avail: NTIS CSCL 13/10

This report presents summaries of 111 projects completed, under way or in planning within the Naval Undersea Center's Ocean Technology Department as of January 1975. It comprises 17 chapters, each of which represents a significant aspect of the department's work, and is intended to demonstrate the scope of NUC's ocean engineering effort and provide specific examples of the Center's capabilities in this area. The projects described exemplify research, development, test or evaluation in the following areas: remotely controlled underwater vehicles, manned submersibles with panoramic visibility, launch and recovery of submersibles, pressure-resistant hulls and materials, machine-mammal systems, diver equipment, salvage systems, undersea imaging, untethered deep-ocean buoys, stationary floating ocean platforms, and self-propelled ocean platforms. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N75-23813 Syracuse Univ., N.Y.
PERTURBATION TECHNIQUES FOR DIRECTIVITY OPTIMIZATION OF YAGI-UDA ARRAYS Ph.D. Thesis
Chien-an Chen 1974 110 p
Avail: Univ. Microfilms Order No. 75-10527

A method was developed for the maximization of the forward directive gain of a Yagi-Uda array by adjusting the inter-element spacings and element lengths. The effects of a finite dipole radius and the mutual coupling between the elements are taken into consideration. Currents in the array elements are approximated by three-term expansions with complex coefficients which convert the governing integral equations into simultaneous algebraic equations. The array directivity is maximized by a double-perturbation procedure. The double-perturbation procedure converges very rapidly to obtain a Yagi-Uda array of nonuniformly spaced elements of unequal lengths which yields a maximum possible directivity. The method eliminates the need for a trial-and-error approach or for interpreting a vast data collection. Numerical examples are given to illustrate the procedure and to show typical obtainable improvements.
Dissert. Abstr.

N75-23814 Illinois Univ., Urbana.
COMPLEX WAVEFORM PHONETIC SPEECH SYNTHESIS Ph.D. Thesis
Michael Paul Hoffman 1974 189 p
Avail: Univ. Microfilms Order No. 75-11692

A new procedure for the synthesis of human speech by rule was presented. The technique has as its base the time domain specification of a complex waveform for each of the phonemes. Distinct waveforms are required for the prevocalic and postvocalic occurrences of some phonemes. The procedure is unique in that contextual variations are provided by a set of algorithms rather than simply concatenating the stored waveforms. Sonograms, time plots, and pitch contours of the natural and synthetic forms of several words are compared. Tests are conducted in which the intelligibility is approximately 90 percent with most listeners being impressed by the naturalness of the synthesized speech. Improvements are suggested to increase the intelligibility and naturalness of the synthesizer. Dissert. Abstr.

N75-23815 Ohio State Univ., Columbus.
THE AUTOMATIC ACQUISITION OF INTERESTING OBJECTS IN A CLUTTERED IMAGE ENVIRONMENT Ph.D. Thesis
Shang-Tsong Shieh 1974 247 p
Avail: Univ. Microfilms Order No. 75-11425

Research was directed toward the elimination of images containing no interesting objects, while retaining all those containing interesting objects. (Interesting means specifically that the picture contains a volatile target such as a truck, an automobile, etc., and this kind of target is called an interesting object). A complex ground scene picture is shown and it is necessary to determine whether or not there is an interesting object in the picture. A potential solution for the problem is presented and three steps are used: (1) preprocessing, (2) feature extraction, and (3) classification. Results show that it is possible to obtain excellent results using very simple features. Dissert. Abstr.

N75-23816 Illinois Univ., Urbana.
NUMERICAL SOLUTIONS TO THE PROBLEMS OF ELECTROMAGNETIC RADIATION AND SCATTERING BY A FINITE HOLLOW CYLINDER Ph.D. Thesis
William Arthur Davis 1974 102 p
Avail: Univ. Microfilms Order No. 75-11688

The singular-integral equations of electromagnetic scattering theory are derived, along with their extensions to thin surfaces and surfaces with edges. Constraints are presented which are necessary for a unique solution to the scattering problems of thin structures. The equations for a finite hollow cylinder are obtained by expanding the field quantities in Fourier series about the cylinder axis. It is found that the variational interpretation of the method of moments can be used as a guide for choosing the basis and testing functions. The spline function of finite support of smoothness, and of best fit is presented. The problems of coupling in the higher harmonics are investigated for the first-harmonic problem. Dissert. Abstr.

N75-23817 Alabama Univ., University.
DESIGN OF FIR DIGITAL FILTERS FOR PULSE SHAPING AND CHANNEL EQUILIZATION USING TIME-DOMAIN OPTIMIZATION Ph.D. Thesis
Gregg Lynn Vaughn 1974 92 p
Avail: Univ. Microfilms Order No. 75-9952

Three algorithms are developed for designing finite impulse response (FIR) digital filters to be used for pulse shaping and channel equilization. The first is the Minimax algorithm which uses linear programming to design a frequency-sampling filter with a pulse shape that approximates the specification in a minimax sense. Symmetry restrictions are not required for the filter impulse response since the generated resonator coefficients are complex-valued. Also, the algorithm produces an efficient filter by selecting the resonators to include in the order of their decreasing contribution to the filter output. Design examples are included which accurately approximate a specified impulse response with a maximum error of 0.03 using only six resonators. Dissert. Abstr.

N75-23818 British Broadcasting Corp., Kingswood (England). Research Dept.
SPECIFICATION OF THE TIMING STABILITIES OF BROADCAST MONOCHROME AND PAL COLOUR TELEVISION SIGNALS
J. R. Chew and D. W. Stebbings May 1975 16 p refs
(BBC-RD-1975/14; PH-137) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Movements of the monochrome picture due to fairly large timing errors are considered, and the effects of the performance of the receiver horizontal-synchronizing circuits are explored. For the simple case in which the timing error is a simple periodic function, a specification is derived for the allowable error for barely perceptible impairment with the worst-case receiver

synchronizing circuits expected. For the usual case in which multiple timing errors occur, an objective measure of the subjective impairment cannot readily be found. To facilitate the assessment of equipment, such as video tape recorders, details are given of a simulator providing horizontal synchronizing-circuit performances equivalent to worst-case and typical receivers. Picture impairments due to rather small timing errors of the order of a few nanoseconds are considered which produce perturbations in the phase of the color subcarrier and cause patterns of varying saturation in the displayed picture. A property of PAL decoding is discussed which has a considerable effect on the visibility of the patterning. This effect is described along with its effect in tightening the specification of the timing stability of broadcast PAL color-television signals. Author

N75-23819 British Broadcasting Corp., Kingswood (England). Research Dept.
ON THE VISIBILITY OF LUMINANCE FLUCTUATIONS IN TELEVISION PICTURES, AND EXPOSURE VARIATIONS IN MOTION PICTURE FILM
E. W. Taylor Apr. 1975 19 p refs
(BBC-RD-1975/13; UDC-621.391.837.3) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The use of discharge lamps as light sources in motion picture film work can lead to a cyclic variation in frame-to-frame exposure. This in turn can cause the overall luminance of the displayed picture to fluctuate. The visibility of such luminance fluctuations over the frequency range 0.1 - 12.5 Hz is investigated, and limits of film exposure variation, over the same variation-frequency range, below which these picture luminance fluctuations should not be visible are recommended. Author

N75-23820*# Linkabit Corp., San Diego, Calif.
DESIGN OF A DIGITAL VOICE DATA COMPRESSION TECHNIQUE FOR ORBITER VOICE CHANNELS Final Report
28 Apr. 1975 63 p refs
(Contract NAS9-14415)
(NASA-CR-141790; DLR-2) Avail: NTIS HC $4.25 CSCL 17B

Candidate techniques were investigated for digital voice compression to a transmission rate of 8 kbps. Good voice quality, speaker recognition, and robustness in the presence of error bursts were considered. The technique of delayed-decision adaptive predictive coding is described and compared with conventional adaptive predictive coding. Results include a set of experimental simulations recorded on analog tape. The two FM broadcast segments produced show the delayed-decision technique to be virtually undegraded or minimally degraded at .001 and .01 Viterbi decoder bit error rates. Preliminary estimates of the hardware complexity of this technique indicate potential for implementation in space shuttle orbiters. L.B.

N75-23821# Communications Research Centre, Ottawa (Ontario).
PROCEEDINGS OF THE CANADIAN WORKSHOP ON ACOUSTIC SURFACE WAVES
D. B. Wohlberg and G. W. Farnell Jun. 1974 59 p Conf. held in Ottawa, 30-31 Jan. 1974 Sponsored by Dept. of National Defence
(CRC-R-1260) Avail: NTIS HC $4.25

Papers given on acoustic surface waves are summarized, and the needs, capabilities, and directions of future activity are assessed. Topics discussed include transducers, bandpass filters, transversal filters, pseudo-random noise generators, pulse compression, material and fabrication considerations, amplification, nonlinear effects, and optical probing. Author

N75-23822# Lockheed Missiles and Space Co., Palo Alto, Calif.
ELEMENTS OF ADDRESS AND ADAPTIVE RADIO TELEMETRY SYSTEMS, CHAPTER 8
F. I. Barsukov and Iu. B. Rusanov [1974] 13 p refs Transl. into ENGLISH from the book "Elementy i ustroistva radiotelemetricheskikh sistem" Moscow, Energia, 1973 p 238-253
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The address memory of the address radio telemetry system is intended for an operational change in the frequency of interrogation over the diverse channels before or during the operation of the system. Programming the channel interrogation be accomplished by an operator at the transmitter or in the presence of a reverse channel by commands from the receiver. The program sets the order of channel tracking and their interrogation frequency, the frequency of snychronization signal tracking, any other parameters of the service signals which are needed to shape any frame of given structure. A simplified block diagram of an address memory unit is given. Author

N75-23823# Lockheed Missiles and Space Co., Palo Alto, Calif.
SOME METHODS OF RECEIVING POLARIZATION MODULATION SIGNALS, CHAPTER 6
K. G. Gusev, A. D. Filatov, and A. P. Sopolev [1974] 21 p Transl. into ENGLISH from the book "Poliarizatsionnaia moduliatsiia" Moscow, Sovetskoe Radio, 1974 p 136-164
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The simplest methods of receiving continuous polarization-modulated signals are described. Some of the units described were investigated experimentally, in particular, signal distortions were measured for diverse degrees of polarization parameter modulation. Practical recommendations for the utilization of any of the circuits were formulated as a result of the theoretical and experimental research. Author

N75-23824# Lockheed Missiles and Space Co., Palo Alto, Calif.
PRINCIPLES FOR THE CONSTRUCTION OF POLARIZATION CONVERTERS AND MODULATORS, CHAPTER 3
K. G. Gusev, A. D. Filatov, and A. P. Sopolev [1974] 15 p refs Transl. into ENGLISH from the book "Polarizatsionnaia moduliatsiia" Moscow, Sovetskoe Radio, 1974 p 63-83
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The principles for constructing microwave and optical frequency polarization converters and modulators are discussed. Passive and active polarization converters are described along with quarter-wave phase shifters, rotatory quarter-wave phase shifter, rotatory half-wave phase shifter, and various types of modulators. M.J.S.

N75-23825# Stanford Research Inst., Menlo Park, Calif.
RADIATION OF ELECTROMAGNETIC WALSH, WAVES, PART 2 Final Report
S. C. Fralick and J. K. Leung Dec. 1974 53 p refs
(Contract F44620-72-C-0020; SRI Proj. 1556)
(AD-A007067; AFOSR-75-0396TR) Avail: NTIS CSCL 17/2

The report demonstrates the possibility of using radiated Walsh waves for communications purposes. This report is a description of the development of a receiver for such a system and test results of the system used for digital communication over ranges up to 300 feet. GRA

N75-23826# National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
ELECTROMAGNETIC NOISE IN MCELROY MINE Summary Report, Jan. 1973 - Jun. 1974
Motohisa Kanda, John W. Adams, and William D. Bensema Jun. 1974 172 p refs
(Contract DI-BM-HO-133005)
(COM-74-11717/7; NBSIR-74-389) Avail: NTIS HC $6.25 CSCL 17B

Two different techniques were used to make measurements of the absolute value of electromagnetic noise in and above an operating coal mine. McElroy Mine, located near Moundsville, West Virginia. A 300-volt-dc and 480-volt-ac machinery was measured to see the electromagnetic environment it created. One technique measures noise over the entire electromagnetic spectrum of interest for brief time periods. It is recorded using broadband analog magnetic tape and the noise data is later transformed to give spectral plots. The other technique records noise amplitudes at several discrete frequencies for a sufficient amount of time to provide amplitude probability distributions. The specific, measured results are given in a number of spectral plots and amplitude probability distribution plots. GRA

N75-23827# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.

A 1964 DIGITAL DATA BASE FOR IONOSPHERIC MODELING. PART B: INCOHERENT SCATTER RADAR RESULTS

G. M. Lerfald and R. B. Jurgens Oct. 1974 41 p refs Prepared in cooperating with EPA, Research Triangle Park, N.C.
(COM-75-10199/8; NOAA-TM-ERL-SEL-36; NOAA-75012405) Avail: NTIS

The Millstone Hill (Massachusetts) Thomson scatter results for March, April, June, September, and December of 1964 are assembled in digtal form. These digital results are archived on magnetic tape. The density and temperature profiles extend from 90 to 1000 km. The profile results are digitized as observed over the height range from 200 km to 700 km. Monthly mean values are introduced, along with a model for the underlying ionization, to extend the lower portion of the density profiles. An exponential extrapolation extends the density profiles at the higher heights. The electron and ion temperature profiles are extended to lower and higher heights, to be consistent with the neutral atmosphere as given by the model of Jacchia. GRA

N75-23828# Naval Intelligence Support Center, Washington, D.C. Translation Div.
PASSIVE RADAR

A. G. Nikolaev and S. V. Pertsov 27 Feb. 1975 97 p refs Transl. into ENGLISH from the book "Radioteplolokatsiya" Moscow, Military Publ. House of the Ministry of Defence, 1970 p 132
(AD-A007651; NISC-Trans-3634) Avail: NTIS CSCL 17/9

The basic ideas and concepts of one of the newest branches of radar, that of passive radar, are discussed. A great deal of attention is devoted to questions of the use of passive radar by the armed forces. The physical fundamentals of passive radar, and the principles on which the construction of passive radars for different purposes are based, are elucidated. Examples of target characteristics, and the very simplest of calculation methods for making an approximate assessment of the service capabilities of passive radars, are cited. GRA

N75-23829# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A PRELIMINARY DESIGN OF A TDMA SYSTEM FOR FLEETSAT

John D. Bridwell and Ira Richer 12 Mar. 1975 92 p refs
(Contract F19628-73-C-0002; AF Proj. 1508A)
(AD-A007823; TN-75-5; ESD-TR-75-137) Avail: NTIS CSCL 17/2

A time division multiplexing scheme is described for use with FLEETSAT. Available communications circuits would be shared among a much larger pool of users by demand assignment, with a central controller allocating satellite resources. The system achieves rapid circuit assignments and preemptions with relatively high efficiency. GRA

N75-23830# Naval Intelligence Support Center, Washington, D.C. Translation Div.
PASSIVE RADAR

A. G. Nikolaev and S. V. Pertsov 10 Jan. 1975 101 p refs Transl. into ENGLISH from the book "Radiotepolokatsiya" Moscow, Military Publishers, 1970 p 3-31
(AD-A007438; NISC-Trans-3619) Avail: NTIS CSCL 17/9

This book sets forth in brief the physical principles of passive radar, describes the functional diagrams and circuit peculiarities of the apparatus, and offers recommendations for modifying radar receivers to adapt them for receiving natural radio-frequency radiations. The concluding portion of the book contains a review of current models of foreign-made passive radar equipment, a description of their tactical and technical capabilities, and some observations on the military and national economic applications of passive radar. GRA

N75-23831# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
CAUSTIC MATCHING: A NEW TECHNIQUE FOR IMPROVING LIMITED-SCAN ANTENNAS Physical Sciences Research Papers

Carlyle J. Sletten and F. Sheppard Holt 17 Dec. 1974 12 p refs
(AF Proj. 5635)
(AD-A007665; AFCRL-PSRP-617; AFCRL-TR-74-0616) Avail: NTIS CSCL 09/5

Reflector antennas designed with the aid of a technique by which the caustics of the subreflector are matched to those of the main reflector are shown to have the improved limited-sector-scanning capabilities. The matching is achieved over angular scanning sectors of interest by positioning and shaping subreflectors for parabolic cylinder and paraboloidal antennas. The important applications are in the traffic control radars and satellite communications where a small-aperture subreflector can be illuminated by a plane-wave source such as a small phased array, resulting in high-grain limited-scan beam-steering on a large-aperture reflector. GRA

N75-23832# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
RAY-TRACING SIMULATION OF SWEPT-FREQUENCY BACKSCATTER IONOGRAMS Environmental Research Papers

Ming S. Wong 25 Oct. 1974 26 p refs
(AF Proj. 5631)
(AD-A007686; AFCRL-ERP-492; AFCRL-TR-74-0539) Avail: NTIS CSCL 04/1

Computed swept-frequency traces of minimum group-path in backscatter-radar ionograms are presented for ionospheric electron distributions in the polar region. Some of the traces for ground backscatter contain cusps that are shown to result when a small fraction of rays from the radar encounter a region in which the vertical electron-density gradient decreases sharply with distance after the rays passed through apogees. An accurate geomagnetic field model is used in obtaining traces for direct backscatter from field-aligned ionization that causes radar auroral clutter. A method is described for representing three-dimensional electron distributions. The method is sufficiently flexible for iterative ray computations, which appear as a reasonable and potentially reliable approach to the problem of converting backscatter-radar ionograms to electron distributions. GRA

N75-23833# Polytechnic Inst. of New York, Brooklyn. Dept. of Electrical Engineering and Electrophysics.
TACTICAL COMMUNICATION SYSTEMS Final Report, 1 Nov. 1973 - 31 Aug. 1974

E. J. Smith and E. J. Lancevich 15 Feb. 1975 56 p refs
(Contract DAHC04-74-G-0062)
(AD-A007260; POLY-EE/EP-75-003; ARO-12147-2-RTL) Avail: NTIS CSCL 17/2

The work described was motivated by the need for better techniques for analyzing, designing, and testing message switches in store-and-forward communications networks and focuses up on such aspects as modeling, higher-level communications languages, and dynamic testing. An approximate analytic model is described in which the store-and-forward switch is represented as a network of queues; the model was applied to the Tactical Automatic Digital Switch (TADS) and a summary of the results and conclusions is given. The first version of a communications-oriented design language (COD) was developed and its structure is described in this report. The instruction format, program structure, and substantial portions of the software code were completed for implementing a proposed dynamic impulse testing technique for TADS; a summary of the work completed is presented. GRA

N75-23834# Naval Undersea Center, San Diego, Calif.
A MAXIMUM ENTROPY FILTER

F. J. Harris Jan. 1975 62 p
(Proj. R3651)
(AD-A007482; NUC-TP-441) Avail: NTIS CSCL 09/4

An adaptive line tracking technique to improve the resolution and tracking performance of standard discrete Fourier transformation techniques is described. The technique employs a maximum entropy, or one-step linear prediction filter. The recursive nature of the filter precludes the necessity of matrix inversion, and a variable memory fade factor forces the filter to rely heavily on recent data to facilitate tracking of nonstationary spectral lines. Author (GRA)

N75-23835# Naval Research Lab., Washington, D.C.
A SIMPLIFIED TECHNIQUE FOR PHASE CONTROL OF

CONFORMAL ARRAYS
J. B. L. Rao and J. K. Hsiao 10 Mar. 1975 44 p refs
(R0284401)
(AD-A007486; NRL-7856) Avail: NTIS CSCL 09/5

One of the most important problems to be overcome in implementing conformal arrays is controlling the element phases for beam steering. A simplified approximate technique for controlling steering phases of conformal arrays on a general surface was developed. The technique is to divide the array into several subarrays and to judiciously locate the elements on the curved surface so that the conventional row -- column phase setting can be used in each subarray. Because of the approximate nature of the technique, some phase errors are introduced. However, for a given array size and shape of the conformal surface, the number of subarrays can be chosen such that phase errors are within a specified limit. Analytical and computed results are presented for the techniques application to arrays on circular and parabolic curves. The results show that in many practical cases the approximate technique can be used with negligible degradation in performance. GRA

N75-23836# Teledyne Micronetics, San Diego, Calif.
PASSIVE RANGING WITH WAVEFRONT SAMPLING Final Report, Feb. 1974 - Feb. 1975
Lee A. Morgan, Steven Weisbrod, and Philip A. Hicks Feb. 1975 73 p refs
(Contract N00019-74-C-0222)
(AD-A007387; R7-75) Avail: NTIS CSCL 17/9

The report describes an experimental effort to assess the reflective properties of the sea surface at near grazing incidence on over-water passive ranging to distant airborne UHF to S-band sources using airborne receiving platforms. Two factors are involved; the effective specularity of the surface to provide the required triangulation information and the capability to separate and accurately measure angles of arrival of the direct and the sea-reflected components with small antenna apertures compatible with airborne installations. GRA

N75-23837# Illinois Univ., Urbana. Dept. of Computer Science.
CORRELATION MODULATION M.S. Thesis
Richard Joseph Kowall Oct. 1974 62 p refs
(Contract N00014-67-A-0305-0024)
(AD-A007338; UIUCDCS-R-74-682) Avail: NTIS CSCL 09/4

The basic purpose of Correlation Modulation is to encode information in a variable time delay between two identical signals. The length of this time delay represents the information we wish to communicate. The two signals are a reference signal, and a time delayed version of this same reference signal. The reference is transmitted on one channel and the delayed version is sent on a second channel. When these two signals are received, they must be compared, and the information carried by the time delay extracted by suitable means. GRA

N75-23838# Naval Undersea Center, San Diego, Calif.
HIGH RESOLUTION SPECTRAL ANALYSIS WITH ARBITRARY SPECTRAL CENTERS AND ADJUSTABLE SPECTRAL RESOLUTIONS Research and Development Report, Jun. - Sep. 1973
Fred Harris Feb. 1975 36 p ref
(AD-A007483; NUC-TP-440) Avail: NTIS CSCL 09/4

A technique was needed to perform spectral analysis with arbitrary resolution bandwidths and with arbitrary band-center locations. A method was derived to realize band centers that are equally spaced on a log-frequency scale, and with bandwidths that vary proportionally with the band centers, or that vary as the square-root of the band centers. GRA

N75-23839# Army Communications-Electronics Engineering Installation Agency, Fort Huachuca, Ariz.
DIGITAL TRANSMISSION EVALUATION PROJECT. RDS-80 TEST Final Report
Harold F. Bower and Edward F. New 15 Mar. 1975 63 p
(AD-A007111; CCC-CED-75-DTEP-005) Avail: NTIS CSCL 17/2

The Raytheon RDS-80 digital multiplex/radio system was tested in back-to-back and actual link configuration for determination of transfer parameters and to develop standard test techniques. The system has a maximum propagation rate of 40.15 Mb/s (600 voice channels) in a 40 MHz bandwidth in the 11 GHz band BER vs RSL characteristics are displayed and analyzed as the primary mode of equipment evaluation. Actual link data is presented for analysis of cross-polarization characteristics and fading. Carrier-to-interference data, T1 line tests and theoretical predictions are compared. Multiple-hop conditions were simulated. Power spectral density characteristics are compared to FCC spectrum requirements. Concepts of link BER availability are presented. GRA

N75-23840# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
RADIATION PATTERN, REACTIVE POWER, AND RESISTIVE APERTURE ANTENNAS Physical Sciences Research Papers
Giorgio V. Borgiotti 8 Jan. 1975 31 p refs
(AF Proj. 4600)
(AD-A007675; AFCRL-TR-75-0014; AFCRL-PSRP-623) Avail: NTIS CSCL 09/5

The main purpose of the report is to establish certain structural properties of a peculiar class of Plane Wave Spectra (PWS) representing an aperture field (or, equivalently of radiation patterns) which make the aperture reactive power equal to zero. To achieve this objective the entire question of the representation of an aperture field through a PWS is reexamined from a novel viewpoint. The Fourier transform (FT) of the transverse electric field on the aperture is considered as a two-dimensional vector field on the wavenumber plane, represented through two scalar functions, which are its coordinates in a chosen vector basis (Section 3). The choice of the latter has an important physical significance since it corresponds to the decomposition of the PWS into two components having differently polarized radiation patterns and different reactive properties. In Section 4, it is shown that the conductance and the susceptance of an aperture can be expressed as integrals (extended over the visible and invisible space) of two quadratic forms (whose explicit expressions depend upon the basis chosen to represent the PWS). GRA

N75-23841# New Mexico State Univ., University Park. Dept. of Electrical and Computer Engineering.
UHF MULTIPATH PHENOMENA IN A MARINE ENVIRONMENT
Keith R. Carver Dec. 1974 165 p refs
(Grant NOAA-04-4-158-41)
(COM-75-10266/5; NOAA-75021201) Avail: NTIS HC $6.25 CSCL 17B

A model is developed which predicts surface multipath signal variability (fading) in a marine environment and is applied to the UHF link between the body or ship and GOES. Experimentally measured results are reported which confirm the prediction of the model that both fading range and median power level should be height dependent. Height-gain data measured using improvised means and only over the 3.5 ft.-14 ft. MSL range indicate that the received power varies twice as rapidly with height as expected. Antenna design information tailored to the buoy situation and the linear array theory are discussed. GRA

N75-23842# National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
BIBLIOGRAPHY OF THE ELECTROMAGNETICS DIVISION, 30 JUNE 1973 - 30 JUNE 1974
Margaret L. Wooley Nov. 1974 27 p refs
(COM-75-10161/8; NBSIR-74-395) Avail: NTIS HC $3.75 CSCL 20N

The publications of the NBS Electromagnetics Division between June 30, 1973 and June 30, 1974 are cited. Topics discussed include the following: Impedance; phase shift and time delay; power; attenuation; noise; pulsed quantities and waveform analysis; field strength and antenna parameters; methods of analysis; automated measurements; applications of EM metrology; waveguides and transmission lines; EM properties of materials; electromagnetic interference; squids and 6-ports. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-23843 Alabama Univ., University.
A FAST-INITIALIZING DIGITAL EQUALIZER WITH ON-LINE TRACKING FOR DATA COMMUNICATIONS Ph.D. Thesis
William J. Barksdale 1974 144 p
Avail: Univ. Microfilms Order No. 75-9882

A theory is developed for a digital equalizer for use in reducing intersymbol interference (ISI) on high speed data communication channels. The equalizer is initialized with a single isolated transmitter pulse, provided the signal to noise ratio (SNR) is not unusually low, then switches to a decision-directed, on-line mode of operation that allows tracking of channel variations. Conditions for optimal tap-gain settings are obtained first for a transversal equalizer structure by using a mean-squared error (MSE) criterion, a first order gradient algorithm to determine the adjustable equalizer tap-gains, and a sequence of isolated initializing pulses. It is shown that by properly selecting the tap-gains of each transversal filter-section, the equalizer can be adjusted to minimize the MSE on the first iteration of the algorithm. A method is proposed for making this selection using the pseudoinverse of the correlation matrix to obtain a best approximation to an orthogonality condition. Dissert. Abstr.

N75-23844 Carnegie-Mellon Univ., Pittsburgh, Pa.
A TESTABILITY MEASURE FOR REGISTER-TRANSFER LEVEL DIGITAL CIRCUITS Ph.D. Thesis
Jack Edward Stephenson 1974 245 p
Avail: Univ. Microfilms Order No. 75-9087

A testability measure which provides a numerical estimate for the ease of generating fault detection tests for large digital circuits was developed. The measure is intended to be used as a tool to help design digital circuits for which test generation is less costly and less time-consuming than it is for circuits designed without considering testability. The testability measure is based on a register-transfer (RT) level circuit description because such a level of description is the most appropriate one for large digital circuits. Further, the RT level description employs functional components rather than logic gates as the basic units, so it can be obtained early in the design process, yet it is specific enough that it contains sufficient information about the circuit to estimate testability. Dissert. Abstr.

N75-23845 Tennessee Univ., Knoxville.
AN INVESTIGATION OF THE THEORETICAL LIMITATIONS OF A CONVERTER CAPACITOR CIRCUIT DURING THE CHARGING AND STORAGE PHASES Ph.D. Thesis
Thomas Joseph Paulus 1974 280 p
Avail: Univ. Microfilms Order No. 75-11181

The theoretical limitations were studied of the charging interval and the storage interval duration for a capacitor storage system consisting of a low leakage capacitor, an emitter-follower clamping circuit, a current-mode switch, and a common-drain FET buffer amplifier. Performance limitations were determined for the charging interval, the storage interval, and the transition time at each end of the charging interval. Experimental techniques were emphasized. A mathematical analysis of an appropriate system model indicated that the charging interval response was exponential with a time constant approximated by the product of the output resistance of the current-mode switch, and the converter capacitor. Fast switching transients occurred at the beginning and the end of each charging interval. The most severe transient was due to the emitter-follower clamp. Dissert. Abstr.

N75-23846 Illinois Univ., Urbana.
THE DESIGN OF MULTIPLE-VALUED ASYNCHRONOUS SEQUENTIAL CIRCUITS Ph.D. Thesis
Stephen James Sheafor 1974 139 p
Avail: Univ. Microfilms Order No. 75-11697

Several areas which are vital to the development of multiple-valued asynchronous sequential circuits are examined. An existing method of designing multi-valued combinational circuits is analyzed in detail, and modifications are presented which extend the applicability of this design to more functions. Storage devices are also examined, and a device is presented which is simple to construct and is useful in the construction of asynchronous circuits. The problem of state assignment for multiple-valued circuits is studied in depth. Methods which minimize the number of state variables are presented, and then analogy to binary row-set and shared-row assignments is demonstrated. An algorithm for producing unicode single transition time assignments is developed, and is shown to produce optimal solutions. Various refinements on this method and other simpler but nonoptimal methods are described. The possibility of essential hazards in the multi-valued case is examined, and methods of designing circuits under this condition are presented. Dissert. Abstr.

N75-23847 Radiotechniques S. A., Caen (France). Div. Industrielle et Technique.
PRELIMINARY STUDIES FOR HIGH TENSION INTEGRATED CIRCUITS Final Report [ETUDES PRELIMINAIRES EN VUE DE L'OBTENTION DE CIRCUITS INTEGRES HAUTE TENSION]
M. DeBrebisson Apr. 1974 29 p In FRENCH
(Contract DGRST-72-70-531)
(MDB/MD-3055) Avail: Issuing Activity

A set of studies for high voltage integrated circuits are reported. Insulation methods, high thickness, high resistivity epitaxial zones, and choice of structures are the main elements discussed. Various insulation methods among which EPIC, CILCO, polycrystalline, p-n junction and dielectric were reviewed, tested, and compared. The best methods were found to be the total dielectric and CILCO (lateral dielectric insulation and epitaxial junction). Suitable epitaxial deposits were obtained and the preparation method is detailed. Solutions were found for all defects problems such as deutritic growth, lines of sliding, peaks, and plane and planar structure transistors were investigated. Up to 250V for BV sub CBO and 40V for BV sub CEO were reached in a plasma structure. ESRO

N75-23848*# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div.
THE 12 GHz IMAGE AND SUM ENHANCED MIXER DIODE CONVERTER Final Report, Aug. 1972 - Aug. 1973
J. E. Degenford and B. A. Newman Oct. 1973 23 p
(Contract NAS5-21845)
(NASA-CR-143792) Avail: NTIS HC $3.25 CSCL 09E

The development, fabrication, and testing of five image and sum frequency enhanced mixed diode converters are discussed. Design specifications include a RF band of 11.7 to 12.2 GHz, an IF band of 1.0 to 1.5 GHz, an IF return loss of $>$ 10 db, band center of 6.2 db, band edge of 6.7 db, LO frequency of 10.7 GHz, LO power of $<$ 20 dbm, and a conversion gain of $>$ 15.8 db. The converter is also capable of $>$ 30 db below desired signals for the third order intermodulation product level for twelve -75 dbm carriers. Author

N75-23849*# District of Columbia Teachers College, Washington, D.C.
INVESTIGATION OF PROBLEMS ASSOCIATED WITH SOLID ENCAPSULATION OF HIGH VOLTAGE ELECTRONIC ASSEMBLIES; ALSO REYNOLDS CONNECTOR STUDY Final Technical Report, 15 Apr. 1974 - 15 Apr. 1975
Renate S. Bever 15 Apr. 1975 92 p refs
(Grant NGR-09-053-003)
(NASA-CR-142803) Avail: NTIS HC $4.75 CSCL 09E

Electric breakdown prevention in vacuum and encapsulation of high voltage electronic circuits was studied. The lap shear method was used to measure adhesive strengths. The permeation constants of air at ambient room temperature through four different space-grade encapsulants was measured. Order of magnitude was calculated for the time that air bubble pressures drop to the corona region. High voltage connectors with L-type cable attached were tested in a vacuum system at various pressures. The cable system was shown to suppress catastrophic breakdown when filled with and surrounded by gas in the corona region of pressures, but did not prove to be completely noise free. Author

N75-23850*# Scientific Translation Service, Santa Barbara, Calif.
FUNCTIONING OF POWER RECTIFIERS AND THYRISTORS FROM 1 JANUARY 1970 TO 31 DECEMBER 1972, NOTING CARRIER INJECTION, EMITTER SHORTS, IGNITION, AND BREAKDOWN
E. Spenke, J. Burtscher et al Washington NASA May 1975 28 p refs Transl. into ENGLISH from German report no. BMFT-FB-T-7407, May 1974 29 p
(Contract NASw-2483)
(NASA-TT-F-16365; BMFT-FB-T-7407) Avail: NTIS HC $3.75 CSCL 20C

The dependence of the carrier mobility on the concentration of the injected carriers was determined experimentally, as well as the distribution of the recombination between the middle region and the border regions. The purpose was to better understand the stationary forward voltage drop across rectifiers. The share of the middle region under normal operation conditions is <20% and for surge current loads, <10%. The local distribution of the breakdown current in power devices with deep pn-junctions was investigated by observing the breakdown radiation in the infrared. A clear connection to resistivity fluctuations (striations) in the starting material was revealed. Author

N75-23851*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFICIENCY AND WEIGHT OF VOLTAGE MULTIPLIER TYPE ULTRA LIGHTWEIGHT dc-dc CONVERTERS
W. T. Harrigill, Jr. and I. T. Myers 1975 10 p refs Presented at Power Electron. Spec. Conf., Culver City, Calif., 9-11 Jun. 1975; sponsored by IEEE
(NASA-TM-X-71735; E-8321) Avail: NTIS HC $3.25 CSCL 10B

An analytical and experimental study was made of a capacitor-diode voltage multiplier without a transformer which offers the possibility of high efficiency with light weight. The dc-dc conversion efficiencies of about 94 percent were achieved at output powers of 150 watts at 1000 volts using 8x multiplication. A detailed indentification of losses was made, including forward drop losses in component, switching losses, reverse junction capacitance charging losses, and charging losses in the main ladder capacitors. Author

N75-23852*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACECRAFT HIGH-VOLTAGE POWER SUPPLY CONSTRUCTION
John F. Sutton and Jesse E. Stern Washington Apr. 1975 161 p refs
(NASA-TN-D-7948; G-7448) Avail: NTIS HC $6.25 CSCL 20C

The design techniques, circuit components, fabrication techniques, and past experience used in successful high-voltage power supplies for spacecraft flight systems are described. A discussion of the basic physics of electrical discharges in gases is included and a design rationale for the prevention of electrical discharges is provided. Also included are typical examples of proven spacecraft high-voltage power supplies with typical specifications for design, fabrication, and testing. Author

N75-23853*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FAILURE ANALYSIS OF ELECTRONIC PARTS: LABORATORY METHODS
Robert J. Anstead, ed. and Ethan Goldberg, ed. Washington 1975 79 p Prepared in cooperation with Sperry Rand Corp., Clearwater, Fla.
(Contract NAS5-21444)
(NASA-SP-6508) Avail: NTIS HC $4.75 CSCL 09C

Failure analysis test methods are presented for use in analyzing candidate electronic parts and in improving future design reliability. Each test is classified as nondestructive, semidestructive, or destructive. The effects upon applicable part types (i.e. integrated circuit, transitor) are discussed. Methodology is given for performing the following: immersion tests, radio graphic tests, dewpoint tests, gas ambient analysis, cross sectioning, and ultraviolet examination. L.B.

N75-23854# Lockheed Missiles and Space Co., Palo Alto, Calif.
CONVERTER OF NON-ELECTRICAL INTO ELECTRICAL QUANTITIES, CHAPTER 2
F. I. Barsukov and Iu. B. Rusanov [1974] 45 p refs Transl. into ENGLISH from the book "Elementy i ustroistva radiotelemetricheskikh sistem" Moscow, Energiia, 1973 p 28-23
Avail: NTIS HC $3.75; Naticnal Translations Center, John Crerar Library, Chicago, Illinois 60616

A measuring converter is described as an instrument which converts nonelectrical quantities into appropriate electrical signals. Several types of standard input signals, called typical perturbations or perturbing functions, were used to investigate and compare the dynamic converter properties. Converter output signals subjected to typical perturbations are called reactions, and the perturbations used were a unit function (a step) and a sinusoidal (harmonic) function of the time. Types of converters discussed include resistive converters, rheostat converters, strain gage resistors, contact resistance converters, thermistors, diode converters for temperature measurement, magnetoohmic converters, electrolytic converters, contact converters, capacitive converters, magnetoelastic converters, electrostatic converters, induction converters, thermocouples, piezoelectric transducers, photoresistors, photocells, ionization converters, gyroscopic converters, accelerometers, and digital transducers. M.J.S.

N75-23855# Illinois Univ., Urbana. Dept. of Computer Science.
LOWER BOUNDS ON MERGING NETWORKS
Andrew Chi-Chih Yao and Foong Frances Yao Oct. 1974 20 p refs
(Grant NSF GJ-41538)
(PB-238554/0; UIUCDCS-R-74-680) Avail: NTIS HC $3.25 CSCL 09B

Let M(m,n) be the minimum number of comparators needed in an (m,n)-merging network. It is shown that M(m,n) > or = n(lg(m+1))/2, which implies that Batcher's merging networks are optimal up to a factor of 2 + epsilon for almost all values of m and n. GRA

N75-23856# Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTROTECHNICAL HANDBOOK, VOLUME 1, BOOK 1, 4TH EDITION REVISED SELECTED PARTS 6 AND 10
P. G. Grudinskogo and G. N. Petrova 12 Nov. 1974 147 p refs Transl. into ENGLISH from the book "Elektro-Tekhnicheskii spravochnik. Tom 1, kniga pervaya, izdanie chetvertoe, pererabotannoe" Moscow, v. 1, no. 1, 4th ed., 1971 p 193-218, 270-305
(AD-A003088; FTD-MT-24-1544-74) Avail: NTIS CSCL 09/1

Electrical insulating designs and insulators for power cables are discussed. G.G.

N75-23857# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
LOAD AND FREQUENCY CONTROL FOR INTERCONNECTED POWER SYSTEMS
1 Jul. 1974 72 p refs
(Grant NSF GI-34969)
(PB-239278/5; SSM-7402-Pt-1; NSF/RA/N-74-150) Avail: NTIS HC $4.25 CSCL 09C

An attempt is made to apply techniques inspired by modern system theory to upgrade the dynamic performance of load frequency control operations while retaining its ingenious decentralized character and while making the operation good in terms of what really defines quality of load frequency control. The first step in the study is a redefinition of the area control error concept in a manner which extends its original meaning to dynamic conditions. Also included in Part 1 is a possible approach to the on line estimation of the redefined area control error. Part 11 will be devoted to the definition of control aims and proposed control algorithms as well as simulation based documentation. GRA

N75-23858# Hughes Research Labs., Malibu, Calif.
SOLID STATE AMPLIFIER FOR SPREAD SPECTRUM COMMUNICATIONS Final Report, Dec. 1972 - Mar. 1974
T. T. Fong and R. S. Ying Feb. 1975 61 p refs
(Contract F30602-73-C-0091)

(AD-A007789; RADC-TR-75-56) Avail: NTIS CSCL 17/2

The report describes development of a CW TRAPATT amplifier designed for use in spread spectrum communication systems. A diamond heat sink, required for high current density CW TRAPATT operation, was developed. The complementary n(+)pp(+) TRAPATT diodes developed exhibited superior performance over their p(+) nn(+) counterpart. A pulsed peak power of 27 W with 42.5 percent conversion efficiency at 7.2 GHz and a CW power of 3 W with 24 percent conversion efficiency at 10.5 GHz were achieved as oscillators. A broadband TRAPATT amplifier was developed which yielded CW power of 4.7 W with 5 db gain at 8.73 GHz and a DC to RF conversion efficiency of 18.5 percent. The amplifier had a 3 db instantaneous bandwidth of 4.6 percent. AM and FM noise measurements were performed on this CW amplifier; the AM noise measured in a 1 KHz window was 110 db below carrier and the FM noise was 100 db below carrier. Phase linearity was also measured; the rms phase deviation was 4.36 degrees in a 3 db bandwidth. GRA

N75-23859# Stanford Univ., Calif. Electronics Labs.
COMPLEMENTARY MOS TRANSISTORS IN MICROPOWER CIRCUITS
Richard Marker Swanson Dec. 1974 208 p refs
(Contract DAAB07-72-C-0229; Grant PHS-GM-17940)
(AD-A007272; SU-SEL-074-055; SU-TR-4963-1) Avail: NTIS CSCL 09/5

Complementary MOS transistor (CMOST) circuits offer great potential for very low power operation. These circuits are analyzed to determine their ultimate obtainable performance, and fabrication techniques are developed that produce circuits with the lowest power-speed product reported to date. The MOST is treated as a distributed nonlinear transmission line to investigate the detailed nature of its transient response. These methods are applied to the analysis of the switching performance of CMOST logic gates. This analysis predicts that power consumption has no lower bound if the gate can be operated at low voltages and if the transistors are small enough. A new MOST model is developed that describes effects that become significant at small voltages and sizes. A method for adjusting MOST threshold voltage by ion implantation is described. GRA

N75-23860# Machlett Labs., Inc., Stamford, Conn.
ELECTRON BEAM SEMICONDUCTOR DEVICE WITH MESA DIODE, RELIABILITY AND FAILURE DETERMINATION Final Report, Jan. 1973 - Dec. 1974
K. Garewal, R. Bierig, and G. DeMars Feb. 1975 28 p Prepared in cooperation with Raytheon Co., Waltham, Mass.
(Contract DAAB07-73-C-0092; DA Proj. 1S7-62705-AH-94)
(AD-A007277; ECOM-73-0092-F) Avail: NTIS CSCL 09/1

Ten water cooled EBS devices were fabricated, processed and delivered to ECOM for life and reliability tests. Of 4 tubes tested thus far one was operated for 1200 hours at a maximum dissipation of 7 watts. Others had relatively shorter life times. In depth analysis of failure was carried out on 2 tubes. GRA

N75-23861# Radio Corp. of America, Somerville, N.J. Solid State Div.
TOTAL-DOSE RADIATION-HARDENED COS/MOS INTEGRATED CIRCUITS Annual Report, 8 Oct. 1973 - 31 Dec. 1974
S. Cohen 14 Mar. 1975 29 p
(Contract N00014-74-C-0079)
(AD-A007618; PRRL-75-CR-16) Avail: NTIS CSCL 09/5

The work on radiation-hardened COS/MOS integrated circuits described in this report was done in two phases. Under Phase I, work was done to evaluate the effects of various SiO2 channel-oxidation techniques on the radiation susceptibility of bulk-silicon and SOS COS/MOS circuits. Procedures for ion-implanting of aluminum in channel oxide and for evaluating characteristics that could be used to predict the radiation hardness of processed wafers were performed. Under Phase II, emphasis has been placed on developing techniques for improving the radiation hardness of COS/MOS circuits on sapphire substrates, and radiation-hardened COS/MOS-on-bulk-silicon integrated circuits were produced. Summaries of the various experimental processes are included. GRA

N75-23862# Radio Corp. of America, Moorestown, N.J. Missile and Surface Radar Div.
POWER TRANSISTOR RELIABILITY INVESTIGATION Final Technical Report, 8 Jan. 1973 - 28 Feb. 1975
Maurice E. Breese, Richard Frey, Lyle Leverick, and William Schaedla 15 Mar. 1975 110 p refs
(Contract N00014-73-C-0121)
(AD-A007587; Rept-8J300A-5) Avail: NTIS CSCL 09/1

The objectives of the investigation were to evaluate the reliability of an existing L-band power transistor, the RCA TA 8694 overlay transistor, introduce the indicated design changes to enhance the reliability, and subsequently evaluate the improved device. The evaluation included RF operation in normal circuits with pulsed waveforms at high temperatures to accelerate failures. The TA 8694 was found to fail predominantly due to metal restructuring due to the thermal cycling caused by the pulsed operation. The principal redesign measure was to change the metal system from aluminum to gold, although internal matching elements were also introduced. The new design, the TA 8777 exhibited no evidence of metal or other pellet failures. The predominant failure mode deduced from evaluation of 4 groups of 12 devices each, was degradation of the series collector bonds. However, an MTF of 1650 hours was achieved at a function temperature of 280C, indicating a satisfactory level of reliability for the intended operational usage. GRA

N75-23863# TRW, Inc., Lawndale, Calif. Semiconductor Div.
RELIABILITY STUDY OF MICROWAVE POWER TRANSISTORS Final Report, Mar. 1972 - Nov. 1974
Ronald N. Clarke and Bryan Stallard Jan. 1975 207 p refs
(Contract F30602-72-C-0288; AF Proj. 5519)
(AD-A007788; RADC-TR-75-18) Avail: NTIS CSCL 09/1

As the fineness of structure in microelectronics is stressed by the need for power in microwave transistors, the minimal amounts of material used in their construction are pushed to their limits. This work seeks to understand those limits for gold metallization and bonding, to verify the modelling experimentally, and to fit the data taken to a working guideline. It also seeks to relate accelerated data taken under normal conditions for more accurate reliability prediction. GRA

N75-23864# Naval Research Lab., Washington, D.C.
A BROADBAND DIGITAL DIODE PHASE SHIFTER USING A MATRIX INTERCONNECTION OF QUADRATURE HYBRID COUPLERS, PHASE 1 Interim Report
C. W. Young, Jr. Feb. 1975 24 p refs
(NRL Proj. R08-36; XF54545007)
(AD-A007294; NRL-7855) Avail: NTIS CSCL 09/5

An analysis of 2-bit digital diode phase shifter using four PIN diodes and a matrix arrangement of four 3-db quadrature hybrids has been performed. The 0 degrees, 90 degrees, 180 degrees, and 270 degrees differential phase states were achieved by using the 90 degrees phase relationship of the hybrid coupler outputs and proper combinations of open circuits and short circuits provided by the diodes with the appropriate bias. The phase state determined at which of two ports of the hybrid matrix the output occurred. Thus an additional SPDT or transfer switch was needed to complete the phase shifter. Broad bandwidths can be achieved, since the bandwidth of the phaser is limited by the hybrid bandwidth and the band over which the diode open and short can be made to track, plus the bandwidth of the single transfer switch. With the addition of a second transfer switch in conjunction with a 45 degrees Schiffman constant phase shift section, a 3-bit, or 45 degrees resolution, phase shifter can be obtained. The effects of certain component errors and imperfections on the performance of the phaser have been presented; a generalized method for an exact error analysis has been derived. GRA

N75-23865# Army Foreign Science and Technology Center, Charlottesville, Va.
PLANE MICROMODULES
B. P. Likhovestkii 25 Sep. 1975 76 p Transl. into ENGLISH from the book "Sovetskoe Radio" Moscow, 1972 p 2-6, 92-115, 143-162. Tables, p 16-17, 24-25, 28-29, 82, 89
(AD-A007854; FSTC-HT-23-0372-74) Avail: NTIS CSCL 09/5

The book presents general principles for the creation of

standard designs of micromodules which use active and passive microelements and miniature attached elements. It provides descriptions of methods for designing and the technology for the manufacture of these articles in test and series production. It presents electrical circuits and the basic parameters of a series of general-purpose plane micromodules and also the design and electrical indices of the basic types of microelements used in them. Different versions of making assemblies and units for small-dimensioned equipment with the use of plane micromodules are examined. GRA

N75-23866# Microwave Semiconductor Corp., Somerset, N.J.
LONG TERM RELIABILITY INVESTIGATIONS OF THE MSC-1330 MICROWAVE POWER TRANSISTOR AND THE AMPAC 1214-30 INTERNALLY MATCHED DEVICE Quarterly Progress Report
Louis G. Walshak Mar. 1975 9 p
(Contract N00014-74-C-0362)
(AD-A007354; QPR-3) Avail: NTIS CSCL 09/1

The objective of the program is to establish the median-time-to-failure (MTF) of the MSC-1330 transistor series using long term accelerated RF life tests of the order of 10,000 hours duration. GRA

N75-23867# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
RADIATION INDUCED ELECTRICAL CURRENT AND VOLTAGE IN DIELECTRIC STRUCTURES Physical Sciences Research Papers
A. R. Frederickson 22 Nov. 1974 41 p refs
(DNA Proj. NWED-QAXT)
(AD-A007670; AFCRL-TR-74-0582; AFCRL-PSRP-613) Avail: NTIS CSCL 09/1

A computational technique has been developed in one dimension for prediction of radiation-induced electrical currents and electrostatic fields in metal-dielectric slab structures. High energy radiation transport effects produce divergent electron currents, time-dependent electrostatic fields, and time-dependent conduction electron currents. These effects are considered and the computational technique predicts electric fields approaching breakdown intensity and time-dependent electrode currents which may even change sign. Brief comments on application of the technique to field effect electronic devices are included. Results are given for several metal-dielectric slab combinations under 200 keV and 1.25 MeV photon irradiations. GRA

N75-23868# General Dynamics Corp., San Diego, Calif. Electronics Div.
CONTROLLABLE LIQUID ARTIFICIAL DIELECTRIC S-BAND PHASE SHIFTERS Final Report, 18 Jun. 1973 - 18 Jun. 1974
S. Mikuteit and W. Bottenberg Feb. 1975 94 p refs
(Contract F30602-73-C-0325)
(AD-A007785; R-74-59; RADC-TR-75-21) Avail: NTIS CSCL 09/5

The report describes the work done to prove the feasibility of developing a new class of microwave phase shifters based on the concept of electrically controllable liquid artificial dielectrics using metallic suspension. The theory of operation shows the explicit relationship between material parameters and device performance characteristics. A new electrode design configuration is described that reduces insertion loss characteristics. Results show that particle agitation is not required. Test data of metallic suspensions, liquid crystals, and certain proteins are given. Test data are given for insertion loss characteristics, VSWR, and phase shift as a function of applied voltage over the band of frequencies from 2.7 to 2.9 GHz. GRA

N75-23869# National Maritime Research Center, Kings Point, N.Y.
ELECTRONIC DOCKING SYSTEMS Final Report
H. Carleton Oct. 1974 39 p refs
(COM-75-10139/4; NMRC-KP-116A) Avail: NTIS HC $3.75 CSCL 13J

Existing literature on electronic docking systems was reviewed. Various systems are described and discussed. Results of interviews with pilots and ship operators, regarding their needs for docking systems, are summarized and a program initiated by NMRC-KP to develop a docking system is described. GRA

N75-24661 Joint Publications Research Service, Arlington, Va.
RESEARCH LAB AT TURDA ELECTROCERAMICA PLANT DESCRIBED
Andrian Savu and Peak Francisc *In its* Transl. on Eastern Europe: Sci. Affairs, no. 464 (JPRS-64751) 13 May 1975 p 34-44 refs Transl. into ENGLISH from Electrotehn., Electron., si Automatica; Electrotehn. (Bucharest), no. 1, Jan. 1975 p 40-46 (For availability see N75-24655 15-99)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N75-23870 Polish Academy of Sciences, Warsaw.
NONSTATIONARY HEAT EXCHANGE IN A FREE MOLECULAR RANGE [NIESTACJONARNA WYMIANA CIEPLA W ZAKRESIE SWOBODNIEMOLEKULARNYM]
Lech Szukszta 1974 37 p refs In POLISH
Avail: Issuing Activity

Nonstationary problems of one dimensional flow were investigated along with rarefied gas dynamics. The density, average velocity, and temperature of gases were determined using numerical analysis. Other topics discussed include free molecular conditions, free boundaries, Maxwell equations, and Boltzmann equations. Transl. by M.J.S.

N75-23871 Michigan Univ., Ann Arbor.
OBSERVATIONS OF SHORT PERIOD INTERNAL WAVES GENERATED BY SHEAR FLOW INSTABILITY Ph.D. Thesis
George Thomas Kaye 1974 167 p
Avail: Univ. Microfilms Order No. 75-10197

Observations of short period internal waves in a small freshwater lake were made by recording temperature fluctuations with the use of a moored directional thermistor array. Wind velocity, surface water current, and vertical temperature profiles were also sampled. Dynamic stabilities of the wind-mixed layer and vertical profiles of the Brunt-Vaisala period were calculated, and an attempt was made to correlate the occurrence of internal waves with these values. Results show that short period internal waves occur frequently, some 20% of the time of observation, and that these waves tended to occur more frequently during times of low dynamic stability of the wind-mixed layer. The data are compared with existing analytical models of shear flow instability. The majority of the short period wave activity can be explained by shear instability theory, if the theory is modified to consider turbulence. Dissert. Abstr.

N75-23872 Pennsylvania State Univ., University Park.
THE DISTRIBUTION OF JET SOURCE STRENGTH INTENSITY BY MEANS OF A DIRECT CORRELATION TECHNIQUE Ph.D. Thesis
John M. Seiner 1974 226 p
Avail: Univ. Microfilms Order No. 75-9840

The radiated acoustic intensity was formulated in terms of an integral over the source region of an acoustic far field pressure-near field velocity coherence. The coherence function was formed by use of a polarity coincidence detector in conjunction with phase matched 4-pole bandpass Butterworth filters. Averaging times were selected to achieve a relative error within ten percent for coherence amplitudes as low as 0.01. The flow field was generated by a contraction cone with a 60 to 1 area contraction ratio, which produced an initially laminar top-hat exit plane velocity profile. All measurements were conducted in a anechoic chamber with a 125 Hz cut-off frequency. The direct correlation measurements were conducted at the peak acoustic emission angle of psi = 30 degrees to the jet axis at a microphone radius of 60 nozzle diameters. The investigation

was limited to the first 10 jet diameters in order to satisfy the far field criterion. Dissert. Abstr.

N75-23873 Illinois Univ., Urbana.
RADIATIVE TRANSFER BETWEEN SURFACES WITH SPECTRAL, DIRECTIONAL, AND TEMPERATURE DEPENDENT PROPERTIES Ph.D. Thesis
William Donald Fischer 1974 135 p
Avail: Univ. Microfilms Order No. 75-11765

Real surface property effects on local and overall heat transfer were studied for a simple system of interacting opaque surfaces irradiated by a collimated solar flux. Tungsten is employed as a representative metal and Roberts model is used to describe the wavelength and temperature dependence of its optical parameters. Relationships of electromagnetic theory are employed to describe directional dependence of spectral properties. Local and overall radiant heat flux results for surfaces with wavelength, temperature and direction dependent properties indicate that heat transfer is more dependent on wavelength than either temperature or direction. Dimensionless local absorbed solar irradiation for surfaces irradiated by a collimated solar flux is found to be a weak function of temperature and to be more strongly dependent on wavelength and temperature. Dissert. Abstr.

N75-23874 Brown Univ., Providence, R.I.
PROBLEMS IN NONLINEAR MECHANICS OF UNSTABLE WAVES IN TURBULENT AND IN STRATIFIED SHEAR FLOWS. PART 1: DEVELOPMENT OF THE NOISE-PRODUCING LARGE-SCALE STRUCTURE IN A TURBULENT JET. PART 2: NONLINEAR KELVINHELMHOLTZ WAVES AND THE VERTICAL MIXING MECHANISM IN A STRATIFIED SHEAR FLOW. PART 3: NONLINEAR INTERACTIONS OF THE LARGE-SCALE COHERENT STRUCTURE AND TURBULENCE IN A FREE SHEAR FLOW Ph.D. Thesis
Lee-Or Merkine 1974 253 p
Avail: Univ. Microfilms Order No. 75-9209

The nonlinear development is discussed of large-scale instability waves in a turbulent jet, with an emphasis on their relation to the near acoustic field. The case of two dimension compressible turbulent jet is analyzed and the relative importance of symmetrical and antisymmetrical waves is discussed. It is found that high frequency waves peak closer to the jet exit than low frequency waves, and that the dominant noise source is located at the end of the potential core. The Kelvin-Helmholtz waves are connected to the problem of clear air turbulence and to the vertical mixing that takes place in the ocean thermocline. It is shown that splitting of the temperature gradient profile is the result of the vertical transport of Kelvin-Helmholtz wave-induced fluxes of momentum and thermal energy. Reynolds stress equations for turbulence were used for analysis of nonlinear interactions of coherent structure and turbulence, and the results indicate that over most of the shear layer, turbulence intensifies whenever the local shear increases. The collapse of the instability wave is a consequence of the interaction between the wave rates-of-strain and the wave-induced turbulent Reynolds stress. Dissert. Abstr.

N75-23875 Illinois Univ., Urbana.
POLARIZATION POTENTIALS AND ELEMENTARY EXCITATIONS IN STRONGLY INTERACTING QUANTUM LIQUIDS Ph.D. Thesis
Charles Henry Aldrich, III 1974 207 p
Avail: Univ. Microfilms Order No. 75-11786

A theory of the density fluctuation excitations in liquid He-3 and He-4 which is valid for excitations in the collisionless regime is presented. The restoring force responsible for the density oscillations is the averaged self-consistent field of all the particles in the liquid, which is described by a polarization potential. Effects associated with both the quasi-particle effective mass and the multiphonon excitations are taken into account. The theory is phenomenological, and the key parameters of the theory were determined by fitting to neutron scattering experiments at the saturated vapor pressure. A simple model for the scalar polarization potential was used to extend the calculation to higher pressures. Good agreement was obtained for the variation with pressure of the roton and maxon energies. Dissert. Abstr.

N75-23876 Purdue Univ., Lafayette, Ind.
AN ANALYTICAL STUDY OF THERMAL TURBULENCE Ph.D. Thesis
Donald Dwight Gray 1974 264 p
Avail: Univ. Microfilms Order No. 75-10882

The turbulent natural convection induced in an initially quiescent, horizontally unbounded layer of fluid by a heat flux anti-parallel to the direction of gravity is considered. The basic approach used is that of the statistical theory of turbulence. Since the flow is neither isotropic nor homogeneous, a new, generalized symmetry assumption is introduced. When applied to the Boussinesq equations this leads to a number of new results for the kinematics of the correlation tensors. Phenomenological arguments are used to study the vertical profile of mean temperature. A new logarithmic relation is found which shows better agreement in certain regions with reported experimental data than any previous theories. In addition, an approximate method is presented which predicts the entire profile and satisfies the boundary conditions exactly. The hierarchy of dynamical equations is derived for both two-point, two-time and one-point, one-time correlations. A linearized method is proposed for the solution of the two-point, two-time equations. The one-point, one-time equations are used to investigate the energetics and vorticity dynamics of the flow. Dissert. Abstr.

N75-23877 Michigan Univ., Ann Arbor.
CONDENSATION HEAT TRANSFER INSIDE HORIZONTAL TUBES WITH INTERNAL AXIAL FINS Ph.D. Thesis
Daniel Leroy Vrable 1974 211 p
Avail: Univ. Microfilms Order No. 75-10327

Tube-side condensation of refrigerant-12 vapor in both smooth and internal axial finned tubes was investigated with experimental and analytical programs. An experimental test facility was designed and constructed to measure local heat transfer and pressure drop performance for the complete condensing range inside a twenty-one foot test section. Three different tube geometries were studied with the increased internal surface area ranging from 1, 1.5, and 2.75 times the internal area without fins. The test apparatus consists of a test section, a boiler, a superheater, an accumulator tank, and a pump forming a closed-loop refrigerant flow circuit. In the analytical program, theory was developed to predict the local heat transfer performance and the existing pressure drop equations for the flow regimes of dispersed, annular, and slug flow, and are extended for use with the internally finned tubes. A computer program was developed to numerically calculate the local values of both the heat transfer coefficient and the pressure gradient along the tube. The empirical equation developed to predict the average heat transfer performance for both smooth and internal axial finned tubes is given. Dissert. Abstr.

N75-23878 North Carolina State Univ., Raleigh.
UNSTEADY MOMENTUM INTEGRAL ANALYSIS OF THE LAMINAR BOUNDARY LAYER ON AN ELLIPTIC CYLINDER OSCILLATING IN PITCH Ph.D. Thesis
Walter Donald Johnson 1974 68 p
Avail: Univ. Microfilms Order No. 75-10382

A theoretical study was conducted to examine the laminar, two-dimensional, unsteady boundary layer on a slender elliptic cylinder oscillating periodically in a steady uniform freestream. For comparison, the solution was also obtained for the case in which the elliptic cylinder is stationary in a freestream of periodically varying incidence. The essential features of the analysis were the representation of the boundary layer parameters as a steady term plus an unsteady perturbation proportional to the incremental angle-of-attack change, the transformation of the usual boundary layer coordinate system such that the location of the separation point appears steady in the new coordinate system, and a relation between the rate at which vorticity is shed into the wake and the time rate of change of circulation. The transformed boundary layer equations were solved by a modification of an unsteady momentum integral technique. Dissert. Abstr.

N75-23879 Iowa State Univ. of Science and Technology, Ames.
LAMINAR FLOW HEAT TRANSFER IN ORDINARY AND AUGMENTED TUBES Ph.D. Thesis
Shun-Wu Hong 1974 288 p

Avail: Univ. Microfilms Order No. 75-10483

Laminar flow heat transfer with uniform heat flux in ordinary and augmented tubes was studied analytically and experimentally to investigate the effect of buoyancy on heat transfer in the thermal entry region of horizontal circular tubes. The effects of temperature dependent properties (density and viscosity) on heat transfer in the fully-developed region of horizontal circular tubes, heat transfer for constant property flow in the thermal entrance region of semi-circular tubes, and augmentation of heat transfer by means of twisted tape inserts are also discussed. An analytical solution for heat transfer in the entrance region of circular tubes was carried out assuming that the wall heat flux is uniform circumferentially and axially. The explicit DuFort-Frankel method was successfully applied to the set of governing partial differential equations. Dissert. Abstr.

N75-23880*+ TRW Systems Group, Redondo Beach, Calif. Materials Science Staff.

AMES HEAT PIPE EXPERIMENT (AHPE) EXPERIMENT DESCRIPTION DOCUMENT

Bruce D. Marcus Jan. 1972 133 p refs

(Contract NAS2-5503)

(NASA-CR-114413; TRW-13111-6033-R0-00) Avail: NTIS HC $5.75 CSCL 13K

A gas-controlled variable-conductance heat pipe was qualified for flight aboard orbiting astronomical observatory (OAO3). Experiments were conducted to determine the performance and reliability of the pipe in the vacuum environment of space, and to demonstrate in a specific engineering application its effectiveness in providing temperature stability for spacecraft equipment which experiences varying electronic duty cycles and changing thermal boundary conditions. System design and hardware are discussed in detail. Author

N75-23881*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A USERS MANUAL FOR A REVISED VERSION OF THE LANGLEY CHARRING ABLATOR PROGRAM

C. W. Stroud and Kay L. Brinkley [1975] 121 p

(NASA-TM-X-72677) Avail: NTIS HC $5.25 CSCL 20M

A computer program is described that will compute the transient response of a thermal protection material to a prescribed heat input at the surface. The program has the capability of analyzing pyrolysis gas chemical kinetics in detail and treating pyrolysis reactions-in-depth. Deposition of solid products produced by chemical reactions in the gas phase is included in the analysis. An outline is given for the theory, detailed operating instructions for the computer program are included. Author

N75-23882*# B & K Engineering, Inc., Towson, Md.

ERTS-C (LANDSAT 3) CRYOGENIC HEAT PIPE EXPERIMENT DEFINITION Final Report

P. J. Brennan and E. J. Kroliczek Mar. 1975 87 p refs

(Contract NAS5-20968)

(NASA-CR-143797; BK005-1009) Avail: NTIS HC $4.75 CSCL 13A

A flight experiment designed to demonstrate current cryogenic heat pipe technology was defined and evaluated. The experiment package developed is specifically configured for flight aboard an ERTS type spacecraft. Two types of heat pipes were included as part of the experiment package: a transporter heat pipe and a thermal diode heat pipe. Each was tested in various operating modes. Performance data obtained from the experiment are applicable to the design of cryogenic systems for detector cooling, including applications where periodic high cooler temperatures are experienced as a result of cyclic energy inputs. Author

N75-23883*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CRITICAL FLOW AND PRESSURE RATIO DATA FOR LOX FLOWING THROUGH NOZZLES

R. C. Hendricks, R. J. Simoneau, and R. F. Barrows 1975 12 p refs Presented at the 14th Intern. Congr. of the Intern. Inst. of Refrig., Moscow, 20-30 Sep. 1975

(NASA-TM-X-71725; E-8347) Avail: NTIS HC $3.25 CSCL 20D

LOX and LN2 data for two-phase critical flow through nozzles were acquired with precision control. The principal measured parameters were inlet conditions, critical flow rate and critical flow pressure ratio. It is conclusively demonstrated that the principle of corresponding states can be applied to two-phase choked flow through nozzles. It is also shown that the proper normalizing parameters are developed, and that current theories can provide an adequate means for extrapolating data to other fluids. Author

N75-23884*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL TRANSIENT TURBINE BLADE TEMPERATURES IN A RESEARCH ENGINE FOR GAS STREAM TEMPERATURES CYCLING BETWEEN 1067 AND 1567 K

Daniel J. Gauntner and Fredick C. Yeh Apr. 1975 30 p refs

(NASA-TM-X-71716; E-8328) Avail: NTIS HC $3.75 CSCL 21E

Experimental transient turbine blade temperatures were obtained from tests conducted on air-cooled blades in a research turbojet engine, cycling between cruise and idle conditions. Transient data were recorded by a high speed data acquisition system. Temperatures at the same phase of each transient cycle were repeatable between cycles to within 3.9 K (7 F). Turbine inlet pressures were repeatable between cycles to within 0.32 N/sq cm (0.47 psia). The tests were conducted at a gas stream temperature of 1567 K (2360 F) at cruise, and 1067 K (1460 F) at idle conditions. The corresponding gas stream pressures were about 26.2 and 22.4 N/sq cm (38 and 32.5 psia) respectively. The nominal coolant inlet temperature was about 811 K (1000 F). Author

N75-23885*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SUBSCALE, HYDROGEN-BURNING, AIRFRAME-INTEGRATED-SCRAMJET: EXPERIMENTAL AND THEORETICAL EVALUATION OF A WATER COOLED STRUT AIRFRAME-INTEGRATED-SCRAMJET: EXPERIMENTAL LEADING EDGE

S. Z. Pinckney, R. W. Guy, H. L. Beach, and R. C. Rogers May 1975 43 p refs

(NASA-TM-X-72682) Avail: NTIS HC $3.75 CSCL 01C

A water-cooled leading-edge design for an engine/airframe integrated scramjet model strut leading edge was evaluated. The cooling design employs a copper cooling tube brazed just downstream of the leading edge of a wedge-shaped strut which is constructed of oxygen-free copper. The survival of the strut leading edge during a series of tests at stagnation point heating rates confirms the practicality of the cooling design. A finite difference thermal model of the strut was also proven valid by the reasonable agreement of calculated and measured values of surface temperature and cooling-water heat transfer. Author

N75-23886*# Boston Univ., Mass. Dept. of Aerospace Engineering.

STEADY INCOMPRESSIBLE POTENTIAL FLOW AROUND LIFTING BODIES IMMERSED IN A FLUID M.S. Thesis

Edward A. Chiuchiolo 1974 123 p refs

(Grant NGR-22-004-030)

(NASA-CR-142817) Avail: NTIS HC $5.25 CSCL 20D

The refinement was investigated of a method for evaluating the pressure distribution on a body surface of arbitrary shape in incompressible flow. The solution was obtained in terms of the velocity potential, through numerical approximations which require the use of a high speed digital computer. The box method and the modal method are described in detail, and were applied to a very thin, rectangular wing in incompressible, steady flow. The box method is found to be more practical as it is applicable to more general geometries (the modal method requires a new set of functions for each geometry), and requires less computer time (fifty percent of that required by the modal method for the same problem). Author

N75-23887*# Boston Univ., Mass. Dept. of Aerospace Engineering.

A FINITE ELEMENT FORMULATION FOR SUPERSONIC FLOWS AROUND COMPLEX CONFIGURATIONS

Luigi Morino Dec. 1974 116 p refs

(Grant NGR-22-004-030)

(NASA-CR-142819; TR-74-01) Avail: NTIS HC $5.25 CSCL 20D

The problem of small perturbation potential supersonic flow around complex configurations is considered. This problem requires the solution of an integral equation relating the values of the potential on the surface of the body to the values of the normal derivative, which is known from the small perturbation boundary conditions. The surface of the body is divided into small (hyperboloidal quadrilateral) surface elements which are described in terms of the Cartesian components of the four corner points. The values of the potential (and its normal derivative) within each element are assumed to be constant and equal to its value at the centroid of the element. This yields a set of linear algebraic equations whose coefficients are given by source and doublet integrals over the surface elements. Closed form evaluations of the integrals are presented. Author

N75-23888*# Martin Marietta Corp., Denver, Colo.
ANALYSIS OF SKYLAB FLUID MECHANICS SCIENCE DEMONSTRATIONS Final Technical Report, Sep. 1974 - May 1975
James R. Tegart and James R. Butz May 1975 159 p refs (Contract NAS8-33109)
(NASA-CR-120765; MCR-75-151-1) Avail: NTIS HC $6.25 CSCL 20D

The results of the data reduction and analysis of the Skylab fluid mechanics demonstrations are presented. All the fluid mechanics data available from the Skylab missions were identified and surveyed. The significant fluid mechanics phenomena were identified and reduced to measurable quantities wherever possible. Data correlations were performed using existing theories. Among the phenomena analyzed were: static low-g interface shapes, oscillation frequency and damping of a liquid drop, coalescence, rotating drop, liquid films and low-g ice melting. A survey of the possible applications of the results was made and future experiments are recommended. Author

N75-23889*# Kanner (Leo) Associates, Redwood City, Calif.
HEAT RECOVERY SYSTEMS FOR INDUSTRIAL FURNACES, PARTICULARLY COKE OVENS
J. H. F. Cassan Washington NASA Jun. 1975 14 p Transl. into ENGLISH from German Patent No. 900930, class 10a, group 401 (Appl. no. C3869V1b/10a, 4 Jan. 1954) 7 p (Contract NASw-2481)
(NASA-TT-F-16400) Avail: NTIS HC $3.25 CSCL 13A

A heat recovery system for furnaces is described. A regenerator system is characterized by the use of single recovery units (one pair for each burner), independent of one another and of the masonry or wall, which form the foundation for the furnace wall system. The individual recovery units are not exposed to any forces or deformation deriving from the surrounding masonry, which might impair their integrity. All the ducts or passages which would normally be located in the intermediate section of the furnace are situated in the lower part of the massive masonry of the recovery system, which is exposed to no expansion and no dislocations. M.J.S.

N75-23890*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPLICATION OF LOCAL LINEARIZATION AND THE TRANSONIC EQUIVALENCE RULE TO THE FLOW ABOUT SLENDER ANALYTIC BODIES AT MACH NUMBERS NEAR 1.0
Richard W. Tyson and Ralph J. Muraca 30 Jan. 1975 52 p refs
(NASA-TM-X-72654) Avail: NTIS HC $4.25 CSCL 20D

The local linearization method for axisymmetric flow is combined with the transonic equivalence rule to calculate pressure distribution on slender bodies at free-stream Mach numbers from .8 to 1.2. This is an approximate solution to the transonic flow problem which yields results applicable during the preliminary design stages of a configuration development. The method can be used to determine the aerodynamic loads on parabolic arc bodies having either circular or elliptical cross sections. It is particularly useful in predicting pressure distributions and normal force distributions along the body at small angles of attack. The equations discussed may be extended to include wing-body combinations. Author

N75-23891*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLUIDIZED BED REGENERATORS FOR BRAYTON CYCLES
Lester D. Nichols 1975 11 p refs Proposed for presentation at Intersoc. Energy Conversion Eng. Conf., Newark, Del., 17-22 Aug. 1975
(NASA-TM-X-71736; E-8364) Avail: NTIS HC $3.25 CSCL 20M

A recuperator consisting of two fluidized bed regenerators with circulating solid particles is considered for use in a Brayton cycle. These fluidized beds offer the possibility of high temperature operation if ceramic particles are used. Calculations of the efficiency and size of fluidized bed regenerators for typical values of operating parameters were made and compared to a shell and tube recuperator. The calculations indicate that the fluidized beds will be more compact than the shell and tube as well as offering a high temperature operating capability. Author

N75-23892# Sandia Labs., Albuquerque, N.Mex.
CHARACTERIZATION OF UNSTEADY GAS DISCHARGE FROM A VESSEL Ph.D. Thesis - California Univ., Davis
S. C. Johnston Jan. 1975 288 p refs
(Contract AT(29-1)-789)
(SAND-75-8207) Avail: NTIS HC $8.75

The discharge of compressed gas from a vessel through an orifice to the atmosphere was investigated and the effects of heat transfer on the discharge were evaluated. Included in the study were experiments to investigate (1) an uncoupling between the heat transfer and gas dynamic contributions to the instantaneous mass flow rate from the vessel, (2) the dynamics of the vessel wall diffusion layer (which is formed by heat addition from the vessel wall to the rapidly expanding gas), including buoyancy driven instabilities and their effect on the discharge process, and (3) bulk temperature evaluation from point temperature measurements in the highly nonuniform thermal environment of the discharging gas reservoir. In addition, a semiempirical theory for determining gas pressure and bulk temperature during discharge was developed. Author (NSA)

N75-23893# Los Alamos Scientific Lab., N.Mex.
KACHINA: AN EULERIAN COMPUTER PROGRAM FOR MULTIFIELD FLUID FLOWS
A. A. Amsden and F. H. Harlow Dec. 1974 134 p refs
(Contract W-7405-eng-36)
(LA-5680) Avail: NTIS HC $5.75

Many fluid flow problems of interest involve the presence of bubbles, droplets, or chunks in a fluid. Because of the resulting likelihood for relative motion, more than one set of field variables is required to describe the dynamics. A computing program, named KACHINA, that significantly advances the ability to handle multifield flows is presented. KACHINA uses the powerful new implicit, multifield (IMF) computing method for handling different material fields, in which the multifield treatment is coupled with an implicit formulation of the equations, permitting calculation of fully interpenetrating flows that at any instant may have both supersonic and far subsonic or incompressible regions in the domain of interest. Although IMF-KACHINA development is a continuing project, the results have already proved its usefulness, even in its present state. The current KACHINA flow diagram and program listing are included. Author (NSA)

N75-23894# Texas Univ., Austin. Center for Particle Theory.
CONSTRAINTS ON THE CONICAL EXPANSIONS IN HYDRODYNAMICAL MODELS
C. B. Chiu and K. H. Wang 1974 5 p refs Sponsored by ERDA
(ORO-3992-198) Avail: NTIS HC $3.25

It is shown that for a conical expansion of ideal fluid, all hydrodynamical quantities such as proper energy density, proper entropy density, proper temperature, etc., cannot admit any angular dependence. In the hydrodynamical model, Landau's treatment on the conical expansion does not satisfy this constraint. Author (NSA)

N75-23895# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
CAVITATION INCEPTION THRESHOLDS IN WATER AND

NUCLEI SPECTRA BY LIGHT SCATTERING TECHNIQUE
E. Yilmaz, F. G. Hammitt, and A. Keller Nov. 1974 39 p refs (Grant NSF GK-1889)
(PB-238448/5; UMICH-01357-38-T) Avail: NTIS HC $3.75 CSCL 20D

Cavitation inception thresholds in water are measured and correlated with nuclei spectra, measured by the laser light scattering technique. The effects of temperature, settling-time, total air content, various impurity particle additions, and polymer addition are examined. GRA

N75-23896# Lockheed Missiles and Space Co., Sunnyvale, Calif.
EXPERIMENTAL STUDY OF MODEL SIZE EFFECTS ON CAVITATION AND VENTILATION OF SURFACE PIERCING STRUTS Final Report
Robert L. Waid and Ray L. Kramer Nov. 1970 81 p refs (Contract N00014-69-C-0182; SR00901)
(AD-A006672; LMSC-D26656) CSCL 13/10

An experimental program was conducted in the Lockheed Underwater Missile Facility to determine the effect of model size on the cavitation and ventilation of vertically, surface-piercing struts. The struts tested had chord lengths of 0.5, 1.0, and 2.0 ft., were manufactured to the same section profile, and were tested at a nominal submergence of one chord length. Tests were conducted at speeds from 17 to 32 fps for yaw angles ranging from 4 to 8 degrees. The sideforce and drag were measured and are presented for cavitating conditions preceeding ventilation inception and for fully-ventilated conditions. Motion pictures of the flow were used to determine quantitative features of the cavitation, spray sheet, and the mechanism of ventilation inception. GRA

N75-23897# General Dynamics Corp., Groton, Conn. Electric Boat Div.
AN EXPERIMENTAL STUDY OF THE SURFACE EFFECT ON A BOUYANT JET
B. S. Ryskiewich and L. Hafetz Jan. 1975 122 p refs (Contract DI-14-31-0001-9045)
(PB-239536/6; U440-74-103; W75-04559; OWRT-C-4276(9045)(1)) Avail: NTIS HC $5.25 CSCL 20D

The effect of the surface on a submerged, round, turbulent, buoyant jet was investigated experimentally. The results show that the surface retards temperature reduction leaving the maximum surface temperature at a higher level than would normally occur from an unbounded jet. The effect is particularly apparent horizontal jets and decreases as the jet angle increases. Jet discharge variables were taken over a broad range; namely, Froude number from 2 to 60.1, discharge angle from 0 to 90 degrees, and submergence depth from 10 to 80 jet diameters. The discharge variables range covers most cases of practical interest and the results, presented in graphical form, provide valuable data which will enable a power plant diffuser designer to execute his design with confidence in the plume behavior and surface effect. GRA

N75-23898# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FLOW OF RAREFIED GAS BETWEEN TWO PARALLEL PLATES
S. L. Gorelov and M. N. Kogan 6 Feb. 1975 21 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 1, no. 6, 1970 p 126-130
(AD-A007303; FTD-MT-24-0379-75) Avail: NTIS CSCL 20/4

The Monte Carlo method was used to accomplish the linear objective of rarefied gas flow between two infinite parallel plates, under the action of pressure and temperature gradients. The calculation results of a flow rate depending on the Knudsen number are compared with data obtained by other methods. Other topics discussed include Poiseuille flow, velocity profiles, and the Navier-Stokes equation. M.J.S.

N75-23899# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPHERICAL CAVITY IN A FREE MOLECULAR FLOW
S. V. Musanov 24 Jan. 1975 36 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 2, no. 2, 1971 p 40-49
(AD-A007290; FTD-MT-24-344-75) Avail: NTIS CSCL 20/4

General solutions are given for integral equations for spherical cavity in a free molecular flow. Analytical formulas are derived for the gas consumption through the cavity, and its thermodynamic characteristics are discussed. The results can be used for the calculation of molecular flows in vacuum technology, free molecular air inlets, the sensors of external flow characteristics, and optical pyrometry. M.J.S.

N75-23900# Air Force Technical Applications Center, Washington, D.C. Foreign Technology Div.
PROBLEMS RELATING TO WIND TUNNEL SIMULATION OF RELAXING FLOWS
K. Robert 18 Feb. 1975 33 p refs Transl. into ENGLISH from Deutsche Luft- und Raumfahrt. Forschungsbericht (East Germany), v. 74, no. 31, 1974 p 1-25
(AD-A007406; FTD-HC-23-0843-75) Avail: NTIS CSCL 20/4

The problems of simulation and transference for wind tunnel test-large scale execution are examined from a fundamental standpoint. Special interest is given to low density hypersonic flows in which relaxation phenomena can take place, and only those transference problems which originate in disequilibrium effects are examined. Technical problems connected with wind tunnel operation and construction are not taken into consideration. GRA

N75-23901# Air Force Technical Applications Center, Washington, D.C. Foreign Technology Div.
EXPERIMENTAL STUDY OF HEAT TRANSFER IN A CRITICAL POINT OF SPHERE IN HYPERSONIC LOW-DENSITY FLOW
V. N. Gusev and Yu. V. Nikoskii 24 Jan. 1975 16 p refs Transl. into ENGLISH from Uch. Zap., Tsent. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 1, 1971 p 122-125
(AD-A007407; FTD-MT-24-0395-75) Avail: NTIS CSCL 20/4

In an experimental study of heat transfer at the critical point of a sphere the possibility is confirmed of using underexpanded nozzles in hypersonic wind tunnels for radiation of the flow about the models over a wide range of Reynolds numbers. Experiments were carried out in a hypersonic shock tube with numbers M 32. GRA

N75-23902# Air Force Technical Applications Center, Washington, D.C. Foreign Technology Div.
EXPLICIT FINITE-DIFFERENCE DIAGRAM FOR THE SOLUTION OF THE PROBLEM OF FLOW BY ABOUT THE ESTABLISHMENT
A. N. Minailos 6 Feb. 1975 26 p refs Transl. into ENGLISH from Uch. Zap., Tsent. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 6, 1972 p 119-124
(AD-A007410; FTD-MT-24-0524-75) Avail: NTIS CSCL 20/4

A two-step finite difference diagram is proposed which differs from previous diagrams in terms of a smaller quantity of arithmetic operations during the calculation of parameters. This diagram was used for the calculation of two dimensional flow. Shock waves, least squares method, numerical analysis, and flow distribution are also discussed. M.J.S.

N75-23903# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE CLASS OF THE EXACT SOLUTIONS OF THE EQUATIONS OF NAVIER-STOKES FOR UNSTEADY FLOW OF THE COMPRESSIBLE GAS IN CHANNELS
A. P. Byrkin 6 Feb. 1975 18 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 3, no. 6, 1972 p 125-129
(AD-A007402; FTD-MT-24-0525-75) Avail: NTIS CSCL 20/4

Solutions were obtained to the Navier-Stokes equation which correspond to the flows of gas under the special law of thermal and mass transfer on the channel flow and along the channel length. Other topics discussed include viscous gas, polar coordinate systems, differential equations, and numerical integration. M.J.S.

N75-23904# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF NONEQUILIBRIUM PROCESSES ON THE GAS-DYNAMIC PARAMETERS IN HYPERSONIC INSTALLATIONS AND IN THE CRITICAL POINT OF A BLUNTED BODY
O. Yu. Polyanskii 15 Jan. 1975 28 p refs Transl. into

ENGLISH from Uch. Zap. Tsagi (USSR), v. 11, no. 5, 1971 p 17-25
(AD-A007414; FTD-MT-24-304-75) Avail: NTIS CSCL 20/4

Formulas are given for evaluating nonequilibrium processes, and it is shown that the pressure coefficient and air temperature in the critical point do not depend on the degree of nonequilibrium of incident flow or on the rates of physicochemical processes in the shock layer. Other topics discussed include vibrational degrees of freedom, enthalpy, entropy, recombination processes, shock waves, and nozzle gas flow. M.J.S.

N75-23905# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
SUPERSONIC LAMINAR BOUNDARY LAYER FLOW PAST A WAVY WALL WITH MULTIPLE SEPARATION REGIONS Interim Report, 1 Jan. 1974 - 1 Jan. 1975
A. Polak, M. J. Werle, V. N. Vatsa, and S. D. Bertke Feb. 1974 48 p refs
(Contract N60921-74-C-0203)
(AD-A007433; AFL-74-12-15) Avail: NTIS CSCL 20/4

Laminar flow over wave shaped walls with multiple separation bubbles were studied using an implicit finite difference technique. Solutions are presented for Mach 3 and 6, various Reynolds numbers, Tw/To = 0.45 and 0.675, and protuberance height to width ratio from 0 to 0.1. Results are compared with empirical correlations and experimental data. Author

N75-23906# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NATURAL OSCILLATIONS OF LIQUID IN A HORIZONTAL CONTAINER WITH SYMMETRIC DOUBLE-CONNECTED CROSS SECTION
I. V. Kolin 24 Jan. 1975 17 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 2, no. 3, 1971 p 117-120
(AD-A007312; FTD-MT-24-0582-75) Avail: NTIS CSCL 20/4

The approximate differential equations were obtained for determining natural vibration frequencies of liquid and coordinates of the points of application of flow forces. Calculation results are compared with experimental results. Other topics discussed include computer techniques, digital computers, stability analysis, and disturbed motion of winged flight vehicles. M.J.S.

N75-23907# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FLOWS WITH LAMBDA-SHAPED SHOCKS AT THE ENTRANCE INTO PLANE SUPERSONIC AIR INLET
V. G. Gurylev 4 Feb. 1975 27 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 3, no. 5, 1972 p 1-8
(AD-A007458; FTD-MT24-0530-75; FTD-MT-24-0530-75) Avail: NTIS CSCL 20/4

The flow parameters of lambda-shaped shock waves formed at the entrance of supersonic air intakes were investigated. Other topics discussed include supersonic flow, wind tunnel nozzles, wind tunnel tests, numerical analysis, static pressure, flow separation, boundary layer interactions, and flow visualization. M.J.S.

N75-23908# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXACT SOLUTIONS OF THE EQUATIONS OF NAVIER-STOKES FOR THE FLOW OF THE COMPRESSIBLE GAS IN CHANNELS
A. P. Byrkin 18 Feb. 1975 25 p refs Transl. into ENGLISH from Uch. Zap., Tsent. Aerogidinamicheskii Inst. (USSR), v. 1, no. 6, 1970 p 15-21
(AD-A007683; FTD-MT-24-0369-75) Avail: NTIS CSCL 20/4

Flat plane flows and axisymmetric flows of ideal gas in linear channels was investigated along with thermal conductivity and mass exchange. Other topics discussed include equations of motion, differential equations, numerical analysis, and cylindrical and spherical shells. M.J.S.

N75-23909# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
AN EXPERIMENTAL PHOTOGRAPHIC INVESTIGATION OF VAPOR BUBBLE COLLAPSE AND LIQUID JET IMPINGEMENT
Edward Earl Timm and F. G. Hammitt Nov. 1974 257 p refs (Grant NSF GK-1889)
(PB-239019/3; UMICH-01357-39-T) Avail: NTIS HC $8.50 CSCL 20D

High speed cinematography was used to experimentally investigate the collapse of spark generated vapor bubbles in water. Bubbles were photographed as they collapsed adjacent to both rigid and compliant surfaces in both static and flowing liquid environments. Spherical bubbles collapsing adjacent to rigid surfaces were found to collapse. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-23910* National Aeronautics and Space Administration. Pasadena Office, Calif.
WIDE ANGLE SUN SENSOR Patent
Larry L. Schumacher, inventor (to NASA) (JPL) Issued 1 Apr. 1975 8 p Filed 28 Dec. 1973 Supersedes N74-18093 (12-09, p 1049) Sponsored by NASA
(NASA-Case-NPO-13327-1; US-Patent-3,875,404; US-Patent-Appl-SN-429437; US-Patent-Class-250-211R; US-Patent-Class-250-203; US-Patent-Class-247-171) Avail: US Patent Office CSCL 18D

A single-axis sun sensor consists of a cylinder of an insulating material on which at least one pair of detectors is deposited on a circumference of the cylinder, was disclosed. At any time only one-half of the cylinder is illuminated so that the total resistance of the two detectors is a constant. Due to the round surface on which the detectors are deposited, the sensor exhibits a linear wide angle of + or - 50 deg to within an accuracy of about 2%. By depositing several pairs of detectors on adjacent circumferences, sufficient redundancy is realized to provide high reliability. A two-axis sensor is provided by depositing detectors on the surface of a sphere along at least two orthogonal great circles. Official Gazette of the U.S. Patent Office

N75-23911 Illinois Univ., Urbana.
AN AUTOMATED MOLECULAR FLUORESCENCE/ABSORPTION SEQUENTIAL ANALYZER WITH LASER SOURCE Ph.D. Thesis
Ronald William Crane 1974 150 p
Avail: Univ. Microfilms Order No. 75-11569

The construction and operation of an automated system with the capability of making either fluorescence or absorption measurements is described. The automated system consists of five major subsystems: the source, the optical instrument, the detector and transducer circuits, the control and interface electronics, and a high speed decimal data processor. The source is a helium-cadmium laser with 20 mW output at 441.6 nm. Analytical results for several chemical determinations are presented so as to demonstrate the system's capability for making either fluorescence or absorption measurements. Fluorescein and Riboflavin are used to demonstrate the dynamic range for fluorescence measurements. The determination of calcium in serum using calcein is presented to illustrate the reproducibility for quantitative fluorometric measurements. An absorption method for potassium dichromate in sulfuric acid is used to demonstrate the applicability of the system for molecular absorption spectrometry. Dissert. Abstr.

N75-23912 Tennessee Univ., Knoxville.
DEVELOPMENT OF A NONPENETRATING INDUCTANCE PROBE FOR MEASURING LUBRICATING FILM THICKNESS IN A DYNAMIC SEAL Ph.D. Thesis
William Ross Duncan 1974 151 p
Avail: Univ. Microfilms Order No. 75-11159

The design equations for a nonpenetrating inductance type

proximity probe and its associated null network are derived. The probe was designed to measure the film thickness between the faces of a dynamic seal with the probe mounted behind a thin stainless steel diaphragm. Computer programs in FORTRAN IV were written that would solve the design equations allowing the user to develop optimization data for the probe. With these programs the user can obtain the sensitivity of the probe output voltage to distance changes as a function of the physical dimensions of the probe and the frequency and amplitude of the drive signal. The programs can be used to determine the required values of the null network components, the output thermal noise voltage generated in the probe and the null network, and the number of turns in each coil. The signal processing electronics designed to be used with the probe is also discussed.

Dissert. Abstr.

N75-23913 Purdue Univ., Lafayette, Ind.
DESIGN, EVALUATION AND APPLICATIONS OF A VIDICON RAPID SCANNING SPECTROPHOTOMETER Ph.D. Thesis
Michael John Milano 1974 150 p
Avail: Univ. Microfilms Order No. 75-10921

The different approaches used in the development of rapid scanning spectrometers were reviewed and grouped into two major classifications, multiplex and dispersion spectrometers. A comparison of the performance characteristics of several rapid scanning instruments has indicated that dispersion spectrometer using electronically scanned array detectors, such as the image dissector tube and vidicon tube, most closely approach the ideal spectrometer for chemical analysis in terms of versatility, photometric accuracy, and speed. A rapid scanning spectrometer using an antimony sulfide vidicon tube was constructed and evaluated. It was found that the antimony sulfide tube responded nonlinearly to varying light levels, but could be used for qualitative studies, such as the detection of intermediate species in chemical reactions. A later version of this instrument using a silicon target vidicon tube has greatly improved performance. Dissert. Abstr.

N75-23914 Alabama Univ., University.
A SYSTEMATIC STUDY OF APLANATIC TWO-MIRROR TELESCOPES WITH APPLICATION TO THE LARGE SPARE TELESCOPE Ph.D. Thesis
Charles Louis Wyman 1974 116 p
Avail: Univ. Microfilms Order No. 75-9957

Aplanatic two-mirror telescopes were systematically studied. Third-order designs were obtained by virtue of closed-form solutions of the aberration equations. These equations comprise the first part of a two-stage computer program. Detailed ray trace analyses were performed on the various designs using a conventional ray trace program in tandem with the closed-form solutions. The performance of the telescopes was determined, and the Aplanatic Cassegrain and Gregorian types are analyzed from the standpoint of the effects of misalignments.

Dissert. Abstr.

N75-23915 Michigan Univ., Ann Arbor.
COMPARISON OF TWO NUCLEUS SPECTRUM MEASURING DEVICES AND THE INFLUENCE OF SEVERAL VARIABLES ON CAVITATION THRESHOLD IN WATER Ph.D. Thesis
Emin Yilmaz 1974 225 p
Avail: Univ. Microfilms Order No. 75-10348

Nucleus spectrum measuring systems were evaluated by measuring natural nuclei content of tap water. The Coulter counter technique which is used extensively in blood cell counting, and relies upon the electrical conductivity of the liquid, and a light scattering technique were both found to be adequate for nucleus spectrum measurement for special cases. The light scattering method is especially advantageous when the water samples contain particles. Inception pressures for cavitation were measured using a sonic horn assembly operating at about 14 KHz. Tap, filtered tap, and degassed tap water samples were used to measure cavitation inception pressures as a function of temperature, gas content, waiting time, addition of different kinds of particles, polymer and wetting agent, magnetic field and fast neutron irradiation. The conical crevice theory was found to be predicting behavior of the inception pressures close enough for most of the variables mentioned. The nucleation pressure was calculated. The conical crevice diameters at the interface are calculated using the bubble dynamics equation, and measured cavitation inception pressures. Dissert. Abstr.

N75-23916 Brown Univ., Providence, R.I.
AN OSCILLATING-CUP VISCOMETER FOR HIGH PRESSURE, HIGH TEMPERATURE MERCURY Ph.D. Thesis
Jean Menno Grouvel 1974 149 p
Avail: Univ. Microfilms Order No. 75-9164

A method was investigated for measuring the viscosity of mercury in the supercritical region. An oscillating-cup viscometer was built which contained fluid enclosed in a small hollow cylindrical pressure vessel suspended from a wire in a vacuum. The torsional oscillation imparted to the vessel was damped out by the viscous dissipation inside the cup. The exact first-order solution to the theory of the oscillating-cup viscometer shows that if the density of the fluid is known, the viscosity can be derived from the knowledge of either the logarithmic decrement or the reduced period. The design parameters were studied carefully to yield an optimal design, and the exact solution was compared with the working formulas proposed earlier. A high temperature instrument was designed and built to measure the viscosity of mercury at higher temperatures. Dissert. Abstr.

N75-23917 Laboratoires d'Electronique et de Physique Appliquee, Paris Limeil-Brevannes (France).
SOLID STATE CAMERA Final Report [DISPOSITIF DE PRISE DE VUE A ETAT SOLIDE]
M. Veilex, M. Berth, M. Cathelin, and G. Durand Sep. 1973 90 p refs In FRENCH
(Contract DGRST-72-7-0529)
(MB/MC-GD-2036/73) Avail: Issuing Activity

A crossbar matrix with two MOST and a photodiode per image point is described in an 8 x 8 matrix embodiment. Such matrices are characterized in static and dynamic regime. Parasitic phenomena due mainly to charge migration when the triggering MOST are acting are discussed. It is shown that for 64 x 64 matrices some layout modifications are required. The video line function should then be replaced by a metallic connection to reduce stray resistance and capacitance, the image point selection should be performed on the MOST not directly related with the photodiode, and the control connection capacitance should be reduced for increased access time and power consumption reduction on the column raster circuits. A transient response study for the MOST was performed together with a computerized simulation of the image point circuit performance. ESRO

N75-23918 Ecole Polytechnique, Montreal (Quebec). Section de Mecanique Appliquee.
THERMAL STRAIN DETERMINATION USING GAGES IMBEDDED IN PLASTIC MATERIAL MOCK-UPS UNDER TIME-DEPENDENT TEMPERATURE VARIATIONS Final Report [DETERMINATION DES CONTRAINTES THERMIQUES A L'AIDE DE JAUGES ENFOUIES DANS DES MODELES DE MATIERE PLASTIQUE SOUMIS A DES SOLLICITATIONS DE TEMPERATURE VARIANT EN FONCTION DU TEMPS]
J. Dubuc, C. A. Laberge, and A. Bazergui Jul. 1974 247 p refs In FRENCH; ENGLISH summary
(Contract DGRST-69-01-866)
Avail: Issuing Activity

The experimental determination of the three dimensional state of thermal strain was made possible using strain gages embedded in epoxy resin models; this is the only technique which provides the complete three dimensional strain tensor in both the steady and transient states. A servo system using a digital processor was developed for the acquisition and processing of data from thermal stress tests and for controlling boundary conditions.

Author (ESRO)

N75-23919*# Battelle Columbus Labs., Ohio.
BISTATIC RADAR SEA STATE MONITORING FIELD TEST
G. T. Ruck, G. K. Kirchbaum, and J. O. Everly Mar. 1975 59 p refs
(Contract NAS6-2006)
(NASA-CR-141394) Avail: NTIS HC $4.25 CSCL 08C

Recent advances in understanding the physical phenomena controlling the interaction of electromagnetic energy with the ocean surface have revealed the possiblity of remote measurement

of the two-dimensional surface wave height spectrum of the ocean using bistatic radar techniques. The basic feasibility of such a technique operating at frequencies in the HF region (3 to 30 MHz) was examined during previous studies and hardware for an experimental verification experiment was specified. The activities have resulted in a determination of the required hardware and system parameters for both satellite and aircraft systems, the development, assembly, and testing of hardware for an experimental aircraft system, the development and initial testing of data processing procedures, and the conduct of an initial flight test experiment. Activities were devoted to completing the assembly and testing of the experimental hardware, completing the experiment planning, conducting a field test experiment, and the processing and analysis of the experimental data. Even though directional spectrum maps of the test area cannot be generated from the measured data, the hardware concept employed appears viable, and solutions to the problems encountered have been identified. Author

N75-23920*# Wisconsin Univ., Madison. Space Science and Engineering Center.
EARTH RADIATION BUDGET MEASUREMENT FROM A SPINNING SATELLITE: CONCEPTUAL DESIGN OF DETECTORS
L. A. Sromovsky, H. E. Revercomb, and V. E. Suomi Apr. 1975 239 p refs
(Contract NAS1-13204)
(NASA-CR-132494) Avail: NTIS HC $7.50 CSCL 14B

The conceptual design, sensor characteristics, sensor performance and accuracy, and spacecraft and orbital requirements for a spinning wide-field-of-view earth energy budget detector were investigated. The scientific requirements for measurement of the earth's radiative energy budget are presented. Other topics discussed include the observing system concept, solar constant radiometer design, plane flux wide FOV sensor design, fast active cavity theory, fast active cavity design and error analysis, thermopile detectors as an alternative, pre-flight and in-flight calibration plane, system error summary, and interface requirements. M.J.S.

N75-23921*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RADIOMETRIC PERFORMANCE OF THE VIKING MARS LANDER CAMERAS
Friedrich O. Huck, Ernest E. Burcher, Edward J. Taylor (GE), and Stephen D. Wall Apr. 1975 53 p refs
(NASA-TM-X-72692) Avail: NTIS HC $4.25 CSCL 14E

The Viking lander cameras feature an array of 12 silicon photodiodes for electronic focus selection and multispectral imaging. Comparisons of absolute radiometric calibrations of the four cameras selected for the mission to Mars with performance predictions based on their design data revealed minor discrepancies. These discrepancies were caused primarily by the method used to calibrate the photosensor array and apparently also from light reflections internal to the array. The sensitivity and dynamic range of all camera channels are found to be sufficient for high quality pictures, providing that the commandable gains and offsets can be optimized for the scene radiance; otherwise, the quantization noise may be too high or the dynamic range too low for an adequate characterization of the scene. Author

N75-23922*# New Hampshire Univ., Durham. Dept. of Physics.
SOLAR GAMMA RAY MONITOR FOR OSO-H (0.3-10 MeV) Final Report
E. L. Chupp, I. U. Gleske, and D. J. Forrest Dec. 1974 278 p refs
(Contract NAS5-11054)
(NASA-CR-143799) Avail: NTIS HC $8.75 CSCL 18D

A gamma ray experiment to be flown aboard the OSO-7 spacecraft is described along with a history of the development of the experiment, a description of the gamma ray detector and its operation, and a short preliminary review of the scientific information obtained during the instruments' lifetime. The gamma ray detector operated an average of 18 hours a day for approximately 15 months. The majority of the data was collected in the solar and antisolar direction, but data at right angles to the spacecraft-sun line was also accumulated. In all, at least two full scans of the celestial sphere were completed. Author

N75-23923*# Kanner (Leo) Associates, Redwood City, Calif.
PHOTOMETRY IN THE 3200-9000 A RANGE ON BOARD THE MARS-5 AUTOMATIC INTERPLANETARY STATION
L. V. Ksanfomaliti and G. N. Krasovskiy Washington NASA May 1975 7 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 87-91
(Contract NASw-2481)
(NASA-TT-F-16347) Avail: NTIS HC $3.25 CSCL 20F

Optical circuitry of the Mars-5 photometers VFM-73 and ITM-73 is depicted, their operation is described, and measurement results are displayed. The VFM-73 photometer is equipped with two objective lenses. One, (with its axis directed parallel to the optical axes of the radiometer, IR-altimeter, and other instruments) is employed for multicolor observations in the 3200-7000 A range with separate filters at: 3200, 3700, 4100, 4900, 5600, and 7000 A. The second lens operates in the scanning mode with its scanline perpendicular to the trace, and the directivity pattern of both lenses is 1 deg. The ITM-73 photometer is intended for measuring brightness gradients in the areas adjacent to the track, and operates in the scanning mode, performing the scanning motion in the plane perpendicular to the orbital plane with the scanline perpendicular to the track. It operates at the wavelength of 8200 A, with a filter bandwidth of about 1000 A. The photometric profiles of the track of 23 February 1974 are shown on all filter wavelengths. Author

N75-23924*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Si(Li) X-RAY ASTRONOMICAL SPECTROSCOPY
Stephen S. Holt May 1975 28 p refs Presented at the Symp. on the Techniques of Solar and Cosmic X-ray Spectroscopy, May 1975 Submitted for Publication
(NASA-TM-X-70894; X-661-75-115) Avail: NTIS HC $3.75 CSCL 03B

The general considerations involved in the choice of Si(Li) as a non-dispersive spectrometer for X-ray astronomy are discussed. In particular, its adaptation to HEAO-B is described as an example of the space-borne application of Si(Li) technology. Author

N75-23925*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A STEERING LAW FOR THREE DOUBLE-GIMBAL CONTROL MOMENT GYRO SYSTEMS
Tsuneo Yoshikawa Mar. 1975 34 p refs
(NASA-TM-X-64926) Avail: NTIS HC $3.75 CSCL 17G

A steering law for three double-gimbal control moment gyro (CMG) systems is proposed. This steering law is applicable to systems with almost any configuration of CMGs and the CMG-out operation needs no special modification. Examples of three double gimbal CMG systems in an orthogonal configuration and in a parallel configuration are shown along with the results of digital simulations. Simulation results show that any command torque can always be met except when the system is in a singular state and that, whenever the system is in, or close to, a singularity, the steering law drives the system state out of the vicinity of the singularity. Author

N75-23926*# Scientific Translation Service, Santa Barbara, Calif.
INVESTIGATION OF EFFECTS OF VIBRATION ON A STRUCTURE
Washington NASA May 1975 6 p Transl. into ENGLISH from the German patent no. P 20 02 633.9-52: W. 14 655170 20/Vo, 12 Jan. 1972 4 p
(Contract NASw-2483)
(NASA-TT-F-16305) Avail: NTIS HC $3.25 CSCL 14B

A patent for a device used to investigate the effects of vibration on a structure is described. The patent also covers nine processes and devices involved in this investigation. Author

N75-23927*# Washington Univ., St. Louis, Mo.
ASTRONOMY AT SUB-MILLIMETER WAVELENGTHS Final Report
Michael W. Friedlander 4 Jun. 1975 6 p
(Grant NGR-26-008-069)

(NASA-CR-142814) Avail: NTIS HC $3.25 CSCL 03B

The first flight test of a gondola containing a Newtonian telescope with a 16 in. primary mirror is described. Bolometer tests were conducted along with gondola design studies, and changes were made in the mechanical system as a result. Parts of the system were rebuilt and tested, and it was found that the flight system had redundant data recording capabilities. In the total flight record, about 160 large signals were noted; about half of these appeared to have the correct shape for genuine signals, and the other were clearly noise spikes (they were large but the signal shape could not have been produced by the observation of a celestial object). M.J.S.

N75-23928*# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES ON MEASURING ULTRASONIC FLOW WITH THE AID OF THE DOPPLER EFFECT

B. Pfau, K. Messmer, H. Meisner, and S. Hagl Washington NASA Jun. 1975 12 p refs Transl. into ENGLISH from Chem.-Ingenieur-Tech. (West Ger.), v. 40, no. 19, 1968 p 952-956

(Contract NASw-2481)

(NASA-TT-F-16393) Avail: NTIS HC $3.25 CSCL 14B

The influence of the flow profile on the reading (mV) of a Doppler ultrasonic flowmeter was studied with one round and one rectangular flow channel. The point of measurement was located directly behind a variable aperture. With laminar or turbulent flow, the measurements without an aperture yielded two straight lines with different slopes. Since the turbulence behind the aperture damps the ultrasound, the reading error does not increase as much as would be expected. In medicine and technology, this procedure can be used for contact-free velocity measurements for mixtures of substances only when the flow profile over the measuring cross section is known, or when the flowmeter can be calibrated at the actual point of measurement. Author

N75-23929*# Kanner (Leo) Associates, Redwood City, Calif.
MODERN ANALYTICAL MEASURING INSTRUMENTS

V. A. Pavlenko and M. D. Shutov Washington NASA Jun. 1975 27 p Transl. into ENGLISH from Acta IMEKO (Budapest), 1961 p 425-448

(Contract NASw-2481)

(NASA-TT-F-16394) Avail: NTIS HC $3.75 CSCL 14B

Analytic measuring instruments are classified in general, then some important groups, automatic gas analyzers, mass spectrometers and radiofrequency spectrometers, are discussed. Soviet advances in making analytical instruments are discussed for each of the three above-mentioned groups. Of the gas analyzers, optical instruments are emphasized. Optico-acoustical (infrared) spectrophoto-metric and high sensitivity photoelectric analyzers are discussed. Also described are thermomagnetic units, with which oxygen can be determined in gas compounds from 1 to 100%. Of the mass spectrometers special mention is given to static (magnetic) apparatus. Dynamic radiofrequency mass spectrometers are also discussed. Finally, radiofrequency spectroscopy and its scientific and industrial importance is outlined. Author

N75-23930*# Battelle Columbus Labs., Ohio.
HOLOGRAPHIC RECORDING MATERIALS DEVELOPMENT Final Report, 29 May 1974 - 24 Mar. 1975

24 Mar. 1975 45 p refs

(Contract NAS1-12324)

(NASA-CR-132672) Avail: NTIS HC $3.75 CSCL 14C

The area of organic cis-trans photoisomerization systems for holographic memory applications was examined. Photochemical studies were made of stilbene, indigo, and thioindigo derivatives in solution and in a variety of polymer matrix materials, to optimize the photorefractive behavior of the chemical system as a whole. Lithium niobate was used to study the writing and reading efficiencies of thick phase holograms. Both phase-wave holograms and Fourier-transform holograms were employed, and a number of reconstruction techniques are discussed. The possibility of using cis-trans photoisomerization of appropriate organic chemicals as the basis for a holographic recording system is confirmed. Author

N75-23931*# Bendix Corp., Teterboro, N.J. Guidance Systems Div.
HYDROSTATIC FLUID BEARING GYRO Final Report

E. Y. Brello Mar. 1975 31 p

(Contract NAS8-24414)

(NASA-CR-120753) Avail: NTIS HC $3.75 CSCL 17G

The design, fabrication, and testing are described of a thermal control assembly capable of precisely controlling the LDG-540 Gyro case temperature at 50 C over an ambient environment range of 23 C and atmosphere pressure to 5 C and a vacuum of 0.00001 torr. The thermal control assembly is a hermetically sealed enclosure about the LDG-540 Gyro with envelope dimensions not to exceed those of the Saturn K8-AB5 Gyro. The heaters are capable of delivery 30 watts at 28 V.D.C. and have dual temperature sensors rated at 750 ohms at 50 C. All six (6) LGD-540 Gyros will be equipped with a fine control heater and a resistance thermometer to monitor the gyro cast temperature. All six gyros will be interchangeable in the thermal control assembly by means of simply assembly techniques. Author

N75-23932*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
STUDY OF A POROUS SURFACE MICROPHONE SENSOR IN AN AEROFOIL

D. U. Noiseux, N. B. Noiseux, and Y. Kadman Mar. 1975 95 p refs

(Contract NAS2-7790)

(NASA-CR-137652; BBN-3022) Avail: NTIS HC $4.75 CSCL 09A

The porous microphone in an airfoil is described as a directional sensor which rejects flow noise. The airfoil allows the sensor to be rotated in the airflow over a wide range of yaw angles, 0 to 90 degrees, avoiding flow separation over the surface of the sensor and its associated additional flow noise. The microphone is discussed in terms of its acoustic properties, vibration sensitivity, effect of Mach number on the directivity function, and flow noise. Additional information on the acoustic calibration of the microphone, the acceleration sensitivity of the airfoil, stationary source and receiver in a moving gas, acoustic tests in airflow, and flow noise tests of the airfoil porous surface sensor is included. M.J.S.

N75-23933*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
LASER GEODYNAMIC SATELLITE THERMAL/OPTICAL/VIBRATIONAL ANALYSES AND TESTING. VOLUME 1: EXECUTIVE SUMMARY Final Report

Jan. 1975 26 p refs 2 Vol.

(Contract NAS8-30658)

(NASA-CR-120754; BSR-4175-Vol-1-Add) Avail: NTIS HC $3.75 CSCL 17H

A program to study a LAGEOS retroreflector design change for optical performance improvement is described. The study objectives, the study approach, the principal assumptions, the type of basic data generated, and the significant results are discussed. Study limitations, implications for research, and suggested additional efforts are also summarized. M.J.S.

N75-23934*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
LASER GEODYNAMIC SATELLITE THERMAL/OPTICAL/VIBRATIONAL ANALYSES AND TESTING, VOLUME 2, BOOK 1 TECHNICAL REPORT Final Report

Jan. 1975 214 p refs 2 Vol.

(Contract NAS8-30658)

(NASA-CR-120755; BSR-4175-Vol-2-Bk-1-Add) Avail: NTIS HC $7.25 CSCL 17H

The results are presented of a retroreflector performance improvement program. The following areas of the program are discussed: retroreflector dimensional verification, initial optical performance analysis, LAGEOS test retroreflector rework, final optical performance analysis, optical performance tests, evaluations and conclusions, and laser wavelength evaluation and dihedral angle selection. Data tables, diagrams, graphs, and photographs are included. M.J.S.

N75-23935*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
LASER GEODYNAMIC SATELLITE THERMAL/OPTICAL/

VIBRATIONAL ANALYSIS AND TESTING, VOLUME 2, BOOK 2 Final Report
9 May 1975 237 p 2 Vol.
(Contract NAS8-30658)
(NASA-CR-120756; BSR-4175-Vol-2-Bk-2-Add) Avail: NTIS HC $7.50 CSCL 17H

The main tasks described involved an interferometric evaluation of several cubes, a prediction of their dihedral angles, a comparison of these predictions with independent measurements, a prediction and comparison of far field performance, recommendations as to revised dihedral angles and a subsequent analysis of cubes which were reworked to confirm the recommendations. A tolerance study and theoretical evaluation of several cubes was also performed to aid in understanding the results. The far field characteristics evaluated included polarization effects and treated both intensity distribution and encircled energy data. The energy in the 13.2 - 16.9 arc-sec annular region was tabulated as an indicator of performance sensitivity. The results are provided in viewgraph form, and show the average dihedral angle of an original set of test cubes to have been 1.8 arc-sec with an average far field annulus diameter of 18 arc-sec. Since the peak energy in the 13.2 - 16.9 arc-sec annulus was found to occur for a 1.35 arc-sec cube, and since cube tolerances were shown to increase the annulus diameter slightly, a nominal dihedral angle of 1.25 arc-sec was recommended.
Author

N75-23936*# Joint Publications Research Service, Arlington, Va.
ITS-K INFRARED CRYOGENIC TELESCOPE-SPECTROMETER ABOARD SALYUT-4
N. Zheleznov, Ya. Golovanov, A. Pokrovskiy, Boris Konovalov, Vitaliy Golovachev, and B. Gerasimov Washington NASA May 1975 24 p Transl. into ENGLISH from various Russian articles
(NASA Order W-13183)
(NASA-TT-F-16355) Avail: NTIS HC $3.25 CSCL 17H

A series of articles are presented on experiments carried out onboard the Salyut-4 orbital space station. Topics discussed include infrared radiation, infrared spectra, Magellanic clouds, X-rays, refrigerating systems, infrared instruments, structure and composition of space matter, and low temperature research.
M.J.S.

N75-23937# Westinghouse Hanford Co., Richland, Wash.
HIGH TEMPERATURE ULTRASONIC TRANSDUCERS FOR IN-SODIUM SERVICE
R. W. Smith, C. K. Day, and W. L. Kelly (ERDA, Washington, D. C.) 1974 4 p refs Presented at the Ultrasonics Symp., Milwaukee, 11 Nov. 1974 Sponsored in part by ERDA
(HEDL-SA-726; Conf-741123-2) Avail: NTIS HC $3.25

Ultrasonic transducers developed for use in the optically opaque, high radiation environment of liquid metal fast breeder reactors (LMFBRs) were used to measure, inspect, and visualize the internal LMFBR components. The transducer described was developed for imaging and ranging applications in liquid sodium during reactor shutdown. To assure rapid, complete wetting (and thus good acoustic coupling) of the stainless steel transducer face by liquid sodium, the face was thermally etched at 1000 C in a vacuum. A layer of gold was deposited on the surface to passivate the face until the transducer was inserted into liquid sodium, whereupon the gold rapidly dissolved, leaving a clean surface exposed to the sodium. The operating temperature limit is about 560 F, the nominal melting temperature of the bonding alloy used to fasten the piezoelectric active element into the stainless steel case. A number of transducers were sucessfully operated for several hundred hours in 500 F liquid sodium.
Author (NSA)

N75-23938# Heimann G.m.b.H., Wiesbaden (West Germany).
IMAGE-STORAGE TUBE FOR SPACE APPLICATIONS. DEVELOPMENT OF THE SEC TARGET Final Report
C. Kunze and W. Heimann Paris ESRO Nov. 1974 62 p refs
(Contract ESTEC-1457/71)
(ESRO-CR-212) Avail: NTIS HC $4.25

A secondary electron conductivity (SEC) target developed for high performance storage tubes to be used onboard future European satellites was investigated. Methods to assess the target resolution are discussed, and techniques to stabilize the target when a suppressor mesh is not used and on burn resistant targets are reported. It is found that the methods tried, although successful in their prime objective, all have implications on resolution, target gain, or lag. An exception is resolution, where the prediction for a complete tube with an improved reading gun is 24 lp/mm (= 600 TV lines/picture height) at modulation transfer function = 50% which is a considerable improvement over existing 1 inch tubes.
ESRO

N75-23939# Calspan Corp., Buffalo, N.Y.
DEVELOPMENT AND EVALUATION OF AUTOMOBILE CRASH SENSORS Final Technical Report, 29 Jun. 1973 - 30 Jun. 1974
Melvin O. Ryder Nov. 1974 225 p refs
(Contract DOT-HS-053-3-725)
(PB-237940/2; CALSPAN-ZQ-5351-V-2; DOT-HS-801-263) Avail: NTIS HC $7.25 CSCL 13F

Research devoted to the investigation of post-contact crash sensing techniques is reported. The research consisted of an extensive survey of existing crash sensor technology, experimental testing of crash sensing devices, and analysis of results. Testing included full-scale crash tests of unmodified vehicles instrumented with crash sensors and accelerometers. Laboratory bench testing of crash sensors was conducted employing a centrifuge device to determine static bias levels and a linear accelerator apparatus to provide dynamic performance information. Parameters investigated included time-to-fire, acceleration level at fire, and sensor velocity change experienced at fire. The development of an induction coil crash sensing device is also reported.
GRA

N75-23940# CBS Labs., Stamford, Conn.
DESIGN STUDY FOR A SENSOR UTILIZING AN ELECTROSTATIC CAMERA. VOLUME 2: APPENDICES Report for 18 Feb. - 31 Dec. 1974
Richard O. Johnson, Robert A. Botticelli, and Daniel Galburt Dec. 1974 205 p refs
(Contract F04701-74-C-0262; AF Proj. 5076)
(AD-A007070; SAMSO-TR-75-36-Vol-2) Avail: NTIS CSCL 14/5

A sensor using an electrostatic storage camera is studied for use in an autonomous space surveillance system. The Teal Amber I target and background parameters and search fan are used to characterize the system sensitivity and data acquisition method. A detailed telescope and mount analysis and camera design analysis are performed based on both panoramic and step-and-stare scan modes. A conceptual design of a data processing system using starfield cancellation followed by streak detection is analyzed. The system survivability and reliability are discussed. A cost-effective laboratory demonstration system is presented. The recommended space surveillance system is described and performance predictions are made based on the Teal Amber target parameters.
GRA

N75-23941# National Bureau of Standards, Washington, D.C. Office of Standard Reference Materials.
STANDARD REFERENCE MATERIALS: THE ROLE OF SRM'S IN MEASUREMENT SYSTEMS Final Report
J. P. Cali, T. W. Mears, R. E. Michaelis, W. P. Reed, and R. W. Seward Jan. 1975 57 p refs
(COM-75-50070/2; NBS-MN-148) Avail: NTIS MF $2.25; SOD HC as C13.44:148 CSCL 14B

This publication is a guide to the use of standard reference materials (SRM's) and should be useful to all users of SRM's particularly those in countries developing national measurement systems. It is not intended to be an exhaustive description of the NBS-SRM program, but rather a review of the role of SRM's play in the measurement system, how SRM's are certified, and what the certification means. To illustrate the use of SRM's several selected industries are described in which SRM's have made significant contributions.
GRA

N75-23942# Honeywell, Inc., St. Louis Park, Minn. Government and Aeronautical Products Div.
CRYOGENIC MASS FLOWMETER DEVELOPMENT Final Report, 1 Sep. 1972 - 31 Dec. 1973
Russell L. Johnson and William R. Dougherty Mar. 1975 134 p

(Contract F04611-73-C-0016)
(AD-A007794; AFRPL-TR-75-9) Avail: NTIS CSCL 21/9

This technical report summarizes results of additional studies on a cryogenic linear momentum mass flowmeter. The original study was described in Technical Report AFRPL-TR-71-83. Signal rolloff problems encountered in that study were attributed to magnetic interaction between the driver and sensor windings of the dualsyn transducer. In the present study, the transducer, referred to as a mycrosyn, was redesigned to separate driver and sensor windings. GRA

N75-23943# Coast Guard Research and Development Center, Groton, Conn.

EVALUATION OF THE EXPENDABLE SURFACE CURRENT PROBE (ESCP) Final Report

G. L. Hufford Dec. 1974 47 p refs
(AD-A007877; CGR/DC-40/74; USCG-D-70-75) Avail: NTIS CSCL 14/2

An evaluation of an expendable surface current probe (ESCP) was conducted by the Coast Guard Research and Development Center using operational units in the First, Seventh, and Thirteenth Districts. A total of 86 probes were tested under simulated search and rescue (SAR) conditions using Coast Guard surface vessels ranging from 40 to 210 feet in length, and from HH-3F and HH-52A helicopters. The evaluation of the ESCP shows that the probe can be launched easily from Coast Guard ships and helicopters; the probe provides an accurate measurement (plus or minus 0.2 knots) of the surface current, quickly and inexpensively, in a broad range of weather and sea surface conditions. The overall performance of the ESCP indicates that it should become the most effective empirical measure of the surface current during a SAR case. GRA

N75-23944# LND, Inc., Oceanside, N.Y.

PRODUCTION ENGINEERING MEASURE FOR HIGH RANGE GEIGER MUELLER TUBE Quarterly Report, Dec. 1973 - Feb. 1974

Robert W. Lehnert Feb. 1974 67 p
(Contract DAAB05-72-C-5869)
(AD-A007258; QR-7) Avail: NTIS CSCL 18/4

This program is an investigation of the proper techniques employed to provide stable, predictable performance G-M tubes for use as the high range detector of the AN/VDR-1. The techniques include special cathode and anode surface treatment to prevent secondary emissions and resultant spurious counts (instability). Four groups of Engineering test samples have been manufactured. Testing on the fourth group has been completed during this reporting period. From all indications the tests prove the units to be completely stable and meet all the requirements of the specification. GRA

N75-23945# Aerospace Corp., El Segundo, Calif. Guidance and Control Div.

A TECHNIQUE FOR DETERMINING THE ACCURACY OF AN INCREMENTAL SHAFT ENCODER

I. Kazangey 23 Sep. 1974 42 p
(Contract F04701-74-C-0075)
(AD-A007781; TR-0075(5901-03)-4; SAMSO-TR-75-65) Avail: NTIS CSCL 14/2

The report presents a unique technique using a rate-integrating gyroscope, rate table, digital processing electronics, and statistical analysis to determine rapidly and precisely the accuracy of an incremental shaft encoder. The rate table is used to rotate both the gyroscope and the encoder input shaft as a function of the encoder output. Such encoders appear in many guidance and control applications requiring precise angular rotation measurement. These encoders typically produce a series of output pulses with each pulse representing an increment of rotation. GRA

N75-23946# United Aircraft Corp., East Hartford, Conn. Research Labs.

NONDESTRUCTIVE HOLOGRAPHIC TECHNIQUES FOR STRUCTURES INSPECTION Final Report, 1 Jul. 1971 - 30 Apr. 1974

Robert K. Erf, Ronald M. Gagosz, James P. Waters, Karl A. Stetson, and Herbert G. Aas Oct. 1974 181 p refs
(Contract F33615-71-C-1874; AF Proj. 7351)
(AD-A007850; UARL-N991208-36; AFML-TR-74-130) Avail: NTIS CSCL 14/2

The theoretical and experimental work, performed during a three year study concerned with a research investigation of nondestructive holographic techniques for structures inspection, are reviewed. Topics discussed include the following: General studies - physical environment effects; General studies - surface finish effects; General studies - develop suitable techniques for a manufacturing or maintenance environment; Specific problem investigations - maximum strain and strain patterns; Specific problem investigations - fatigue cracks; Specific problem investigations - NDT. GRA

N75-23947# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

LABORATORY AND FLIGHT RESULTS OF THE MICROSTRIP PLASMA PROBE Physical Sciences Research Papers

Nicholas V. Karas 17 Dec. 1974 55 p refs
(AF Proj. 2153)
(AD-A007685; AFCRL-TR-74-0617; AFCRL-PSRP-618) Avail: NTIS CSCL 20/9

The microstrip plasma probe, a new diagnostic tool for use in the investigation of ionized media, has been developed and successfully tested both in the laboratory and in an actual flight. It is flush mounted (therefore causes no aerodynamic disturbances); simple in geometric shape (therefore can be modified to fit curved surfaces and ruggedized to withstand shock and vibration); only a fraction of the operating wavelength in length (therefore saves on payload space); and operates with low power (therefore does not disturb the plasma which it is measuring). Experimental results, obtained from both the laboratory and from an actual flight, have been compared to theory and to experimental data from other probes. In both instances the results are close. GRA

N75-23948# Strathclyde Univ., Glasgow (Scotland). Centre for Industrial Innovation.

OPTICAL STRAIN RECORDING, ANALYSIS OF STRAIN HISTORIES IN STRUCTURES Scientific Report, Jun. 1973 - Jan. 1975

Colin A. Walker, James McKelvie, Edwin R. North, and Jacques J. P. Sivewright 7 Feb. 1975 23 p refs
(Grant AF-AFOSR-2566-73; AF Proj. 9767)
(AD-A007829; EOARD-TR-75-14) Avail: NTIS CSCL 14/2

A new system for measuring strain on the whole-field basis is described for aircraft. The system in its present form enables in-service strain monitoring to be carried out more thoroughly than before. The report analyses the need for a whole-field method of strain monitoring, and discusses both the drawbacks of established techniques, and the advantages to be gained from the use of a service-compatible multiplied Moire' system. The methods of site operation and optical processing are described with examples. GRA

N75-23949# Hughes Research Labs., Malibu, Calif.

PYROELECTRIC FILM/LIQUID CRYSTAL DETECTOR FOR 10.6 MICROMETERS REGION Final Report, 1 May 1973 - 31 Jul. 1974

J. David Margerum, Michael J. Little, and P. O. Braatz Nov. 1974 199 p refs
(Contract F33615-73-C-5129; AF Proj. 7367)
(AD-A007852; AFML-TR-74-268) Avail: NTIS CSCL 17/5

The development of a new type of large area infrared detector cell with visible light readout is studied in which a liquid crystal layer is electro-optically activated by a pyroelectric film. These studies include the evaluation of pyroelectric films and their poling techniques, the evaluation of liquid crystals for use with pyroelectric currents, analysis of thermal time constants in various cell layers, evaluation of signals obtained with test cells, and the development of prototype detectors. Polyvinylidene fluoride (PVF2) is selected as the best large area pyroelectric material available. In operation with 10.6 micrometer laser exposures, the effects of the pyroelectric generated voltage across the liquid crystal are obscured by thermal flow effects. However, a revised design is recommended in which a conductive faceplate is used

to thermally isolate the pyroelectric film from the liquid crystal layer. GRA

N75-23950# Naval Research Lab., Washington, D.C.
AN INDIRECT METHOD FOR MEASURING SURFACE BASED TEMPERATURE INVERSIONS
Aristides Stamulis Mar. 1974 19 p refs
(AD-A007872; NRL-MR-2748) Avail: NTIS CSCL 04/2

An indirect method for determining and measuring surface-based temperature inversions is proposed. The instrumentation for this purpose is a constant air monitor that measures the natural radioactivity of the atmosphere and records it on a strip chart. By means of deflections in the normal background radioactivity, the beginning and end of the inversion, as well as the time of maximum deflection, can be determined. In addition, a prolonged deflection continuing into the afternoon indicating that an air episode or smog alert may be forecast. Comparison of this method with that used by the National Weather Service Forecast Office gives reasonable agreement. Differences are probably due to local climatic differences, topography, and to inclusion of data for Saturdays, Sundays, and holidays. GRA

N75-23951# Naval Postgraduate School, Monterey, Calif.
A HIGH FREQUENCY PLATINUM RESISTANCE THERMOMETER SYSTEM FOR MEASURING TURBULENT ATMOSPHERIC TEMPERATURE FLUCTUATIONS Technical Report, 1 Jul. 1974 - 1 Feb. 1975
Noel E. J. Boston and Edman L. Sipe Feb. 1975 43 p refs
(NR Proj. 083-275; RR1310301)
(AD-A007284; NPS-58Bb75021) Avail: NTIS CSCL 04/2

A sensor and electronic system has been developed and used to measure high frequency, small scale atmospheric temperature fluctuations. The sensor consists of a platinum wire 0.25 micrometers in diameter and 0.30mm in length. The wire has a time constant of less than 10 microseconds in a 4 m/sec air flow. With a detection current of 50 microamps its sensitivity is 0.063 millevolt/degree C. The electronic system consists of an 80kHz multivibrator, bridge, bridge amplifier, synchronous detector and DC amplifier. The overall system frequency response is flat from DC to 4.5 kHz. The bridge has a noise level of 0.40 microvolts rms and is capable of measuring temperature changes of 0.048C. The overall system noise level varied from 0.18 mv at 10 Hz to 1.6 mv at 1 kHz. Methods are suggested for improving these figures. GRA

N75-23952# Northrop Corp., Hawthorne, Calif.
HOLOGRAPHIC STEREOGRAM CONVERSION PROGRAM Final Technical Report
John T. McCrickerd Feb. 1975 61 p
(Contract F30602-73-C-0132)
(AD-A007786; RADC-TR-75-31) Avail: NTIS CSCL 14/5

Practical methods are described for making holographic stereograms from aerialphoto transparencies. The stereograms are viewed in white light without spectacles. They use holography to selectively convey left and right stereoscopic viewpoints to respective eyes of the observer, who subjectively perceives the display as three-dimensional. Left and right pictures are directly overlapped as double-exposure focused-image-plane holograms. Cross-talk between the left and right views is minimized by using a transparent, phase-type, thick-film holographic medium such as dichromated gelatin. Bragg-reflection conditions are satisfied throughout the emulsion, to maximize hologram brightness. GRA

N75-23953# General Dynamics/Electronics, San Diego, Calif. Electronics Div.
MICROWAVE HOLOGRAPHY FOR ANALYSIS OF CONFORMAL ARRAYS
R. A. Hayward, E. L. Rope, and G. Tricoles Feb. 1975 62 p refs
(Contract N00019-74-C-0259)
(AD-A007359; R-74-048-4) Avail: NTIS CSCL 09/5

The report describes a new method for determining the field near a radiating antenna, which may be planar or conformal. The method uses phase and intensity values that are measured by scanning a probe antenna over a spherical surface. The surface may be in the Fresnel or Fraunhofer regions: in fact, it is chosen big enough to reduce antenna interactions but small enough to reduce reflections from the surroundings. The directive properties of the probe seem relatively unimportant because it is constantly pointed toward the antenna. The method computes the field at the antenna. The computations use the complex conjugate of the measured field so that the method is holographic. In physical terms the conjugation establishes sources that generated waves travelling inward from the measurement surface. Note that in this method the source antenna and the point at which the field is evaluated are inside the measurement surface. The authors deal with backward propagation. In contrast, other methods compute farfield patterns from data measured on a surface that separates the source from the field point. GRA

N75-23954# Arizona Univ., Tucson. Optical Sciences Center.
THE EFFECTS OF ABERRATIONS IN SYNTHETIC APERTURE SYSTEMS Final Technical Report, May 1972 - Sep. 1974
R. Brian Hooker Jan. 1975 207 p refs
(Contract F30602-72-C-0392; AF Proj. 6244)
(AD-A007774; RADC-TR-74-345) Avail: NTIS CSCL 20/6

Recent interest in the use of synthetic aperture optical systems for astronomical and reconnaissance applications prompted this study. The imaging characteristics of a synthetic aperture system consisting of six circular elements positioned on a circle were determined for the case when piston error, tilt, defocus, spherical aberration, astigmatism or coma was introduced into one element of the array. In addition, system defocus was introduced across all elements of the array. The effects of the aberrations on the optical wavefront, the point spread function, and the image of an extended object were determined. The optical transfer function was calculated by a digital computer for the case of small aberrations and was measured experimentally for the case of large aberrations. Synthetic aperture systems produce imagery having an unconventional appearance which is accentuated by aberrations. Special demands are placed on the photointerpreter and on photointerpretation equipment from degrading already low contrast imagery. GRA

N75-23955# California Inst. of Tech., Pasadena.
THE SPACE BANDWIDTH PRODUCE OF MULTI-CHANNEL COHERENT PROCESSES Final Technical Report, Jun. 1971 - Nov. 1974
Richard MacAnally and Alexander Livanos Feb. 1975 75 p refs
(Contract F30602-71-C-0371)
(AD-A007775; RADC-TR-75-16) Avail: NTIS CSCL 09/2

Many functions can be expanded in terms of various orthogonal functions. Some better known examples are cosines and Laguerre functions. The purpose of this effort is the establishment of the optimum set of such functions to be used as basis functions for the description of spatial filters for the detection of the members of each of several classes of objects. This will enable the definition of numerous spatial filters by the manipulation of a relatively small set of basis functions. Such a system would have the added advantage of permitting filter generation in near real time. This effort will attempt to develop a technique for defining and measuring parameters for classes of objects in near-real time, thus allowing for practical automatic pattern recognition. GRA

N75-23956# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
INFRARED GAS FILTER CORRELATION INSTRUMENT FOR IN-SITU MEASUREMENT OF GASEOUS POLLUTANTS Final Report, Jul. 1972 - Jun. 1974
E. E. Burch and D. A. Gryvnak Dec. 1974 64 p refs
(Contract EPA-68-02-0575)
(PB-239467/4; U-6121; EPA-650/2-74-094) Avail: NTIS HC $4.25 CSCL 07D

An infrared analyzer employing gas cell correlation techniques was designed and constructed to measure the concentrations of carbon monoxide, nitric oxide, sulfur dioxide, hydrogen chloride, and hydrogen fluoride in the effluent of stationary sources. An infrared beam is directed across the stack to a retroreflector and back so that the instantaneous average concentration is measured continuously without disturbing the constituents of the effluent. A small, removable, fixed-position grating monochromator acts as a unique optical filter that passes narrow spectral

intervals that are centered at wavelengths where the gas to be detected will absorb. GRA

N75-23957# National Bureau of Standards, Washington, D.C.
AN AUTOMATED SYSTEM FOR PRECISION CALIBRATION OF ACCELEROMETERS Final Report
Apr. 1974 201 p refs
(COM-75-10147/7; NBSIR-74-482; DOD/CCG-69-13) Avail: NTIS HC $7.25 CSCL 14B

An automated system is described for accelerometer calibration under realtime control by a small, dedicated digital computer. The hardware components of the system and the software programs are given. The software automatically regulates the rate and amount of data collected based on analysis of input data. Printout of the frequency response of test accelerometers is on a teletypewriter and can be stored on a magnetic tape. Manual operation of the system is also described. GRA

N75-23958# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
GENERALIZED CHARACTERISTICS OF ELECTRICAL CONDUCTANCE FILM THICKNESS GAUGES
J. Mikielewicz and F. G. Hammitt Dec. 1974 25 p refs
(Grant NSF GK-40130)
(PB-238949/2; UMICH-012449-7-I) Avail: NTIS HC $3.25 CSCL 14B

Calibration of miniature electrical-conductivity gauges for measuring water film thickness flowing along a wall as a function of position and time is discussed. The results from several gauges at various temperatures are combined into a generalized plot where the gauge geometry and water conductivity alone are variables. Experimental scatter of data from all gauges at all temperatures tested is reasonably small when presented in this format. GRA

N75-23959# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
LIQUID FILM THICKNESS MEASUREMENT: DESIGN AND USE OF A CONDUCTANCE PROBE
Peter Fenyes and F. G. Hammitt Dec. 1974 22 p refs
(Grant NSF GK-40130)
(PB-238950/0; UMICH-012449-6-I) Avail: NTIS HC $3.25 CSCL 14B

A gauge has been designed for measuring liquid film thickness. This gauge will be used, along with several other devices, to monitor film formation, movement, and breakdown in order to study erosion which occurs in the low pressure ends of steam tunnels. GRA

N75-23960# Analytical Research Labs., Inc., Monrovia, Calif.
DEVELOPMENT OF SAMPLING DEVICES FOR GASEOUS ATMOSPHERIC TRACERS Environmental Monitoring Series Report, 1 Jun. 1973 - 1 Jun. 1974
C. L. Deuel and R. M. Roberts Jul. 1974 64 p refs
(Contract EPA-68-02-1235)
(PB-238921/1; Rept-2601-F; EPA-650/4-74-050) Avail: NTIS HC $4.25 CSCL 07D

An air sampler was developed to be used to collect over protracted periods and to facilitate the measurement of atmospheric tracer compounds released in meteorological diffusion studies. Tests were conducted to determine the absorptive capacity of various sorbents potentially suitable for collecting such electronegative tracer compounds as SF6 and CF3SF5. A field practical sampler, incorporating the best sorbent, a high surface-area coconut charcoal, was then designed and subjected to laboratory tests. The effects on sampler performance of various atmospheric influences, such as composition, pollutants, temperature, and tracer loading and level were determined. GRA

N75-24657 Joint Publications Research Service, Arlington, Va.
DIGITAL FILM AND PRECIPITATION METER, AND OIL POLLUTION METERING DEVICE
In its Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 5-6 Transl. into ENGLISH from Meres Es Automatika (Budapest), no. 2, 1975 p 55 (For availability see N75-24655 15-99)

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-23961 New Orleans Univ., La.
ELECTRON LASER-PULSE SCATTERING Ph.D. Thesis
Milton Dean Slaughter 1974 73 p
Avail: Univ. Microfilms Order No. 75-10816

General formulae are derived for the computation of scattering amplitudes for electron-laser pulse processes. Standard Feynman-Dyson S-matrix techniques were used except that the Furry interaction picture was substituted for the Dirac interaction picture. The laser pulse is described quantum-mechanically as a coherent state wave-packet. The electron is represented by wave-packet solutions of the Dirac equation in the case of scattering boundary conditions, or by Volkov wave-packets when nonscattering boundary conditions are considered. The scattering amplitudes for the processes of stimulated Compton scattering, inverse bremsstrahlung, and pair production in a laser pulse are given for scattering and nonscattering boundary conditions. The existence of entirely new, quantum-electrodynamical, nonlinear corrections for any electron-laser pulse process is discussed. Dissert. Abstr.

N75-23962 Tennessee Univ., Knoxville.
LASER BEAM DEFLECTION UTILIZING INDEX OF REFRACTION GRADIENTS IN LIQUID MEDIUMS Ph.D. Thesis
James Edward Kalshoven, Jr. 1974 74 p
Avail: Univ. Microfilms Order No. 75-11173

A technique for scanning a laser light beam based on index of refraction gradients in liquids was predicted and tested. The technique was developed to deflect laser light for a projection television system and more generally for random access or electronically controlled beam positioning. Various desirable parameters for a scanning system are considered. The Kerr electro-optic effect is studied in order to establish basic principles of index of refraction gradient deflection. A laser with polarized output is used for important substantiation of the predictions. The calculations and experimental results agree well for a simple electrode arrangement. Practical difficulties are discussed. Dissert. Abstr.

N75-23963 Illinois Univ., Urbana.
THE GENERATION OF STEP-TUNABLE FAR INFRARED RADIATION BY PHASE MATCHED DIFFERENCE FREQUENCY MIXING IN PLANAR DIELECTRIC WAVEGUIDES Ph.D. Thesis
David Edward Thompson 1974 136 p
Avail: Univ. Microfilms Order No. 75-11698

The generation of step-tunable far infrared radiation by difference frequency mixing various pairs of CO2 laser lines in an optically nonlinear medium is analyzed. The addition of waveguide dispersion to bulk dielectric dispersion was examined, and the use of this combination to achieve phase matching of the difference frequency mixing interaction was investigated theoretically and experimentally. Milliwatt level pulsed signals were generated from 200 microns to 800 microns wavelength by mixing orthogonally polarized, Q-switched pulsed CO2 laser signals in planar dielectric waveguides of GaAs. Data is correlated to the theoretical expectations of power, bandwidth, and output coupling angle, and proposals were made for further uses of this far infrared, integrated optics configuration, nonlinear mixing device. Dissert. Abstr.

N75-23964 Brown Univ., Providence, R.I.
TIME DEVELOPMENT OF ULTRASHORT PULSE GENERATION FROM A Nd:GLASS LASER WITH A SATURABLE DYE AND SHORT LASER PULSE DAMAGE OF GaAs AND ZnTe AT 1.06 MICRONS Ph.D. Thesis
Chung Lam Sam 1974 120 p
Avail: Univ. Microfilms Order No. 75-9234

The fluctuation theory of ultrashort pulse (USP) generation in a Nd:glass laser with a saturable absorber, according to Letokhov, is outlined. When the lasing threshold is reached, many ultrashort fluctuation spikes grow independently of one another, until the strongest spike acquires sufficient intensity to saturate and bleach the absorber. The fast relaxation of the absorber

precludes weaker spikes from passing through while it is still in the bleached state. The strongest spikes then experience a nonlinear growth and evolve into the output pulse train, until the population inversion in the active medium is fully depleted. Laser damage experiments on GaAs and ZnTe with passively Q-switched nanosecond pulses and mode-locked picosecond pulse trains at 1.06 microns were carried out. Dissert. Abstr.

N75-23965# Defence Research Establishment Valcartier (Quebec).
DEFORMATION OF THE ATMOSPHERE BY INTENSE LASER BEAMS AT 10.6 MICRONS [DEFORMATION PAR L'ATMOSPHERE DES FAISCEAUX LASER INTENSES A 10.6 MICRONS]
L. R. Bissonnette Mar. 1974 21 p refs In FRENCH; ENGLISH summary
(DREV-TN-2099/74) Avail: NTIS HC $3.25

The absorption-induced distortion is discussed of intense 10.6 microns-laser beams propagating in the atmosphere. The relevant characteristics scales are identified from which the governing equations are systematically written in a fully nondimensional form. There are six similarity parameters which are used to define the principal regimes of propagation. Threshold curves (energy versus pulse duration) are derived that indicate regions of weak and strong distortion. These results constitute useful guidelines in the design of high energy, 10.6 microns, laser sytems for applications in the atmosphere. Author

N75-23966# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE QUESTION OF INDUCED MOSSBAUER GAMMA RADIATION
V. I. Vorontsov and V. I. Vysotskii [1974] 8 p refs Transl. into ENGLISH from Kuantovaia Elektron. (Kiev)., no. 8, 1974 p 63-69
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

A gamma laser with induced Mossbauer lines was investigated along with the singularities of Mossbauer gamma radiation induced by ultrasound. The results of the investigation indicate the possibility of controlling the frequency and spatial properties of spontaneous (photon) gamma radiation. The possibility of adjusting the frequency of a narrow gamma radiation line within the phonon spectrum limits of a crystal permits a significant approach to the solution of the problem of producing a gamma resonator. M.J.S.

N75-23967# Lockheed Missiles and Space Co., Palo Alto, Calif.
QUESTIONS OF THE KINETICS OF STIMULATED GAMMA RADIATION
V. L. Vorontsov and V. I. Vysotskii [1974] 12 p refs Transl. into ENGLISH from Kvantov. Elektron. (Kiev), no. 8, 1974 p 69-79
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The application of quantum electronics theory and methods to quantum systems of the gamma radiation band was used to solve fundamental problems in the production of a gamma laser: obtaining a sufficient concentration of long-lived active nuclei with a moderately broadened radiation line shape, the possibility of producing gamma resonators, the peculiarities of gamma-radiation kinetics. It is shown that the singularities of the kinetics of induced Mossbauer gamma radiation result in a dependence of the process cross-section on the time and shape of the signal being amplified. The establishment of a resonance value of the stimulated radiation cross-section occurs during a time commensurate with the lifetime of the inversion state, which affects the nature of the process. As the working model for a theoretical investigation a single-pass two-level gamma amplifier was used which is described by a system of quasi-classical equations for the amplitude A of the potential-vector; it can be obtained on the basis of the Maxwell and Schroedinger equations without relying upon any special model representations and also valid in the gamma-band. Author

N75-23968# Los Alamos Scientific Lab., N.Mex.
CALCULATIONS OF LASER INDUCED SPALL IN ALUMINUM TARGETS
A. R. Larson Nov. 1974 39 p refs Revised
(Contract W-7405-eng-36)
(LA-5619-MS-Rev) Avail: NTIS HC $3.75

One-dimensional, plane geometry calculations of material response to laser-target interaction are presented. The targets are homogeneous slabs of aluminum. Most calculations were done with the target in vacuum, but some investigations into the effects of having the target in air are also reported. A modified version of the CHART D code was used for the calculations. Parameters that were varied include laser light wavelength, duration of constant power pulses, target material thickness, and laser energy absorbed by the target. Laser energy was varied to identify thresholds at which spall occurs. As laser pulse times approach the value of two shock transit times, results revealed (1) that a large increase in energy is required for spall, and (2) that the thickness of the spalled layer increased greatly. Comparison of calculation with a single experimental result showed that spall layer thickness as calculated agrees with that measured. Author (NSA)

N75-23969# California Univ., Livermore. Lawrence Livermore Lab.
CALCULATION OF ROTATIONAL NONEQUILIBRIUM IN A PULSED HF LASER
J. R. Creighton and R. K. Pearson 15 Nov. 1974 22 p refs Presented at Conf. on Chem. and Molecular Lasers, St. Louis, Oct. 1974 Sponsored by ERDA
(UCRL-75814; Conf-741048) Avail: NTIS HC $3.25

Waveforms and population distributions were calculated by a numerical model and compared with experiment for an electric discharge initiated, pulsed NE3 + H2 chemical laser. The model treats each rotational state separately and allows rotational relaxation betweenn adjacent states. Lasing is treated by equations equivalent to laser rate equations. Good agreement is obtained between calculated and experimental wave forms. Initially, population distributions are far from equilibrium. At the end of the pulse, they approach, but do not reach, Boltzmann equilibrium. Author (NSA)

N75-23970# Sandia Labs., Albuquerque, N.Mex.
PROBES FOR DENSITY MEASUREMENTS OF F2, HF, AND DF IN CONTINUOUSLY OPERATING CHEMICAL LASERS
R. A. Hill and P. J. Hargis, Jr. Jan. 1975 48 p refs
(Contract AT(29-1)-789)
(SAND-74-0432) Avail: NTIS HC $3.75

The applicability of electron-beam excited fluorescence and laser-Raman scattering to provide point measurements of the F2 number density and population densities of HF (v) or DF (v) in continuous HF or DF lasers was examined. The Fabry-Perot interferometric comb filter should provide a method for measuring the densities of HF (v) or DF (v) where v = 0, 1, and perhaps 2 through the rotational Raman hot bands. Author (NSA)

N75-23971# Los Alamos Scientific Lab., N.Mex.
MODELOCKED, MULTILINE PULSED CO2 OSCILLATOR
M. S. Piltch Jan. 1975 3 p refs
(Contract W-7405-eng-36)
(LA-5839-MS) Avail: NTIS HC $3.25

A modelocked, multiline oscillator was developed for use in laser-induced fusion investigations. A sodium chloride etalon provided the wavelength-dependent loss mechanism and an acousto-optic modulator was used for modelocking the laser. Author (NSA)

N75-23972# Los Alamos Scientific Lab., N.Mex.
CARBON DIOXIDE LASER DEVELOPMENT AND ASYMMETRY IN LASER DRIVEN IMPLOSIONS
R. F. Benjamin, K. Boyer, E. H. Farnum, C. A. Fenstermacher, R. J. Fries, D. V. Giovanielli, R. P. Godwin, A. J. Lieber, G. H. McCall, and T. F. Stratton 1974 16 p refs Presented at the 5th Conf. on Plasma Phys. and Controlled Nuclear Fusion Res., Tokyo, 11-15 Nov. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1883; Conf-741105-50) Avail: NTIS HC $3.25

A brief description is given of the CO2 laser amplifiers at Los Alamos. They are based on the generation of controlled discharges in suitable gas mixtures through the application of external electron beams as the ionizing agent with electrical excitation of the lasing molecules provided by a second,

nonsustaining discharge. Some experimental results showing asymmetry in laser driven implosion of hollow shells are described. NSA

N75-23973# Oak Ridge National Lab., Tenn.
EFFECT OF NEUTRON IRRADIATION ON THE MICROSTRUCTURE AND PROPERTIES OF TITANIUM-STABILIZED TYPE 316 STAINLESS STEELS
E. E. Bloom, J. O. Stiegler, and J. M. Leitnaker Jan. 1975 20 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4731) Avail: NTIS HC $3.25

The effects of titanium additions up to 0.6 wt % on the irradiation-induced swelling and changes in creep-rupture properties were investigated. Samples were irradiated in the EBR-2 at temperatures in the range 450 to 700 C to a maximum neutron fluence of 7.8 x 10 to the 26th power n/sq m. In annealed material, the irradiation-induced swelling exhibited a minimum in the range of 0.2 to 0.4 wt % Ti. The minimum in swelling was directly attributable to a minimum in the concentration of voids. Samples irradiated in the 20%-cold-worked condition exhibited slight densification at 3.0 x 10 to the 26th power n/sq m at both 500 and 600 C. A small density decrease (0.23%) occurred during irradiation to 6.6 x 10 to the 26th power n/sq m. Postirradiation creep-rupture ductility was maximum for alloys containing 0.23 and 0.33 wt % Ti. The observed swelling behavior in the annealed material is thought to be associated with changing amounts of titanium and carbon in solution in the austenite as the total titanium concentration is increased. Author (NSA)

N75-23974# Canada Centre for Remote Sensing, Ottawa (Ontario).
ON THE RELATIVE MERITS OF USING EITHER CW HELIUM-CADMIUM OR PULSED NITROGEN LASERS AS THE FLOURESCENCE EXCITATION SOURCE IN AIRBORNE LASER FLOUROSENSING SYSTEMS
M. Bristow and N. DeVilliers Nov. 1973 7 p ref Supersedes Ref-73-11
(PB-238845/2; TN-73-6; Ref-73-11) Avail: NTIS HC $3.25 CSCL 20E

The relative merits of using either low power CW or high power pulsed lasers as the excitation source in airborne laser-fluorosensing systems are discussed. Using performance data for commercially available lasers, it is shown that for most airborne applications, pulsed nitrogen lasers provide significant advantages over CW He-Cd lasers. GRA

N75-23975# Naval Research Lab., Washington, D.C.
A COMPUTER CODE FOR TIME DEPENDENT RECOMBINATION LASERS
Walter W. Jones and A. W. Ali Mar. 1975 26 p refs
(NRL Proj. N01-33)
(AD-A007292; NRL-MR-2999) Avail: NTIS CSCL 07/4

A computer code is developed which, starting from completely stripped ions and a given electron temperature and density, solves for the population densities of excited states, inversion densities and gain with emphasis on short wavelength lasers. GRA

N75-23976# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
HF/DF CHEMICAL LASER PERFORMANCE MODIFICATION BY CHEMICAL ADDITIVES Final Report, 29 Oct. 1973 - 30 Jun. 1974
Shelby C. Kurzius Jun. 1974 63 p refs
(Contract DAAH01-74-C-0; DA Proj. 1T6-62609-A-308)
(AD-A007263; LMSC-HREC-TR-D390429; RK-CR-75-3) Avail: NTIS CSCL 20/5

The premixed DF supersonic flow chemical laser promises favorable operational characteristics. To establish feasibility, an experimental program has been initiated to develop the chemical inhibition and ignition techniques required to achieve premixed supersonic flow HF/DF chemical laser operation. This report documents the available results. Premixing the inhibition by 1 to 4% O2 has been achieved in 5 g/sec and 50 g/sec nozzles operated at 200 torr total pressure. Stable combustion downstream of the nozzle exit plane has also been achieved, with ignition attained by both NO and COS chemical activators, and by pulsed ac and continuous dc electrical discharges across the flow. No HF or DF continuous wave laser power was measured in tests performed at cavity pressures from 60 to 80 torr. Analytical results obtained suggest that with further refinement of the techniques developed, high specific powers should be attainable at the relatively high cavity pressures employed in these experiments. Achieving more uniform ignition of the flow in the primary area in need of development. GRA

N75-23977# Aerospace Corp., El Segundo, Calif. Lab. Operations.
NEW LASER OSCILLATION IN THE OXYGEN ATOM Interim Report
David G. Sutton, Luis Galvan, Jr., and Steven N. Suchard 25 Feb. 1975 7 p
(Contract F04701-74-C-0075)
(AD-A007780; TR-0075(5641)-4; SAMSO-TR-75-46) Avail: NTIS CSCL 07/4

A new laser oscillation has been observed in a pulsed discharge of He and O2. This oscillation at 2.652 micrometers has been identified as belonging to the O(I) atom. GRA

N75-23978# Catholic Univ. of America, Washington, D.C. Dept. of Chemistry.
INFRA-RED LASERS AND INFRA-RED SPECTRA OF FREE RADICALS Final Report
F. X. Powell and Thomas J. McGee 26 Mar. 1975 19 p refs
(Contract N00014-67-A-0377-0010)
(AD-A007720) Avail: NTIS CSCL 20/5

In this report on the influence of laser media in carbon dioxide laser pumping, the authors conclude that the reaction of nitrogen atoms with nitric oxide as well as two metastable of nitrogen can be used as laser energy sources. In addition, the reaction of nitrogen atoms with carbon disulfide and carbonyl sulfide proceed at rates sufficient to energize the carbon dioxide laser. Chemical mechanisms are proposed. GRA

N75-23979# Science Applications, Inc., Arlington, Va.
A TUNABLE DYE LASER DIAGNOSTIC FACILITY Semi-annual Technical Report, 24 Jun. - 24 Dec. 1974
J. I. Conolly, Jr. 11 Feb. 1975 12 p refs
(Contract N00014-74-C-0394)
(AD-A007620; SAI-74-628-WA; SATR-1) Avail: NTIS CSCL 20/5

The direct measurement of the fluorescent lifetimes of excited atomic and molecular species requires an excitation source of short duration compared to the lifetime of interest. In the case of allowed electronic transitions in metal halides, of interest as possible laser candidates, such lifetimes are typically tens of nanoseconds. Thus a laser pulse duration of less than 10 nanoseconds will be required. For maximum versatility, wavelength tunability over the visible spectrum is desired. These requirements are uniquely met by pulse laser-pumped dye laser systems. In this category are the following types: Solid pulsed Nd:YAG Laser, Solid Pulsed Ruby Laser, and Pulsed Gas N2 Laser. The N2 gas pulsed laser was recommended for the laser induced fluorescence experiments. GRA

N75-23980# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
MOLECULAR LASERS IN E-BEAM STABILIZED DISCHARGES Final Report, 15 Mar. 1972 - 30 Jun. 1974
S. R. Byron, L. Y. Nelson, C. H. Fisher, G. J. Mullaney, and A. L. Pindroh Feb. 1975 182 p refs
(Contract N00014-72-C-0430; ARPA Order 1807)
(AD-A007577; MSNW-75-105-4) Avail: NTIS CSCL 20/5

This report describes the results of a program directed toward the development of new lasers in the infrared and visible regions of the spectrum, utilizing electron-beam-stabilized electric discharge excitation. The first laboratory observations of laser emission from HF and DF excited directly by an electric discharge were made. The effectiveness of vibrational transfer from H2 and D2 to HF and DF, respectively, was verified. A quantitative model of the kinetics of the electric discharge and the vibrational populations of H2 and HF was formulated for Ar/H2/HF mixtures. A model for long pulse visible laser emission from electronically excited molecules was formulated that involves rapid collisional

quenching of the vibrational energy of the electronic states. The application of this approach to N2 electric discharge lasers was explored through fluorescence emission studies. The effect of energy pooling was studied. The effect of various additives such as He, Ar, SF6, and C2H6 on the populations of several vibrational levels of each of these excited states was investigated. GRA

N75-23981# Oregon Graduate Center for Study and Research, Beaverton. Dept. of Applied Physics and Electronic Science.
EXPERIMENTAL PULSED LASER, REMOTE CROSSWIND MEASUREMENT SYSTEM, FEASIBILTY STUDY AND DESIGN, PART 2 Interm Report, 1 Jul. - 31 Dec. 1974
J. Fred Holmes, J. Richard Kerr, Michael E. Fossey, R. Larry Jacob, and Myung H. Lee Jan. 1975 40 p refs
(Contract DAAD07-74-C-0094)
(AD-A007350; ECOM-75-1) Avail: NTIS CSCL 04/2

The system analysis, design and construction of a sixty-four element, optical receiver for use with a double pulsed laser as a remote crosswind measurement system is described. In addition, formulations are developed for the mean square measurement error of the mean and variance resulting from estimating the statistics of the received intensity by a finite number of partially correlated samples, and from electronic noise. The results of the error analysis are applied to the case of a spherical wave. GRA

N75-23982# Utah Univ., Salt Lake City.
PARAMETERS OF THE PULSED PHOSPHORUS LASER SYSTEM Final Report, 15 Jan. - 15 Mar. 1974
G. R. Fowles Mar. 1975 29 p refs
(Contract F29601-73-C-0045; AF Proj. 3326)
(AD-A007694; AFWL-TR-74-63) Avail: NTIS CSCL 20E

The pulsed phosphorus vapor laser has been investigated in detail. A number of laser plasma tubes have been constructed and this performance has been evaluated. The normal output parameters of peak power, gain, and beam quality have been determined for the visible orange ion laser lines at 6024 A and 6043 A. The effects of the tube geometry and excitation pulse power as well as carrier gas type and pressure have been investigated. In addition, a number of new laser lines occurring in the infrared were discovered. Transition assignments for these lines were made, and the characteristics of the laser output were determined. GRA

N75-23806 Institut Franco-Allemand de Recherches, St. Louis (France).
APPLICATION OF MODE LOCKED SOLID STATE LASERS TO PHOTOGRAPHIC INVESTIGATION OF TRANSIENT PHENOMENA [ANWENDUNG MODENGEKOPPELTER FESTKOERPERLASER ZUR PHOTOGRAPHISCHEN UNTERSUCHUNG SCHNELL ABLAUFENDER VORGAENGE]
Guenter Gulitz *In its* Selected Contrib. to High-Speed Phys. 1974 p 23-34 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

N75-23807 Institut Franco-Allemand de Recherches, St. Louis (France).
OUTPUT ENERGY OPTIMIZATION OF A DYE LASER [OPTIMIERUNG EINES FARBSTOFFLASERS BEZUEGLICH DER AUSGANGSENERGIE]
Antoine Hirth *In its* Selected Contrib. to High-Speed Phys. 1974 p 35-47 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

N75-23808 Institut Franco-Allemand de Recherches, St. Louis (France).
STUDY AND APPLICATION OF PULSED CO2 LASERS [UNTERSUCHUNG UND ANWENDUNG GEPULSTER CO2-LASER]
Manfred Hugenschmidt *In its* Selected Contrib. to High-Speed Phys. 1974 p 49-65 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-23983 Syracuse Univ., Utica, N.Y.
CONTACT RESISTANCE STUDIES OF SINTERING USING ULTRA CLEAN COPPER SURFACES IN ULTRA HIGH VACUUM Ph.D. Thesis
Manouchehr Massachi 1974 90 p
Avail: Univ. Microfilms Order No. 75-10557

Fundamental investigation of the sintering process due to surface diffusion of copper was carried out in ultrahigh vacuum by observing changes in contact resistance. When two copper rods were brought together at a very light load, at high temperature, the decrease in resistance due to the growth of the contact area as a function of time and temperature was recorded. At temperatures below 505 C no junction growth was observed due to the very low values of diffusivity. At temperatures between 515 C and 947 C growth proceeded according to a seventh power law which is consistent with a surface diffusion model proposed by Nichols and Gjostein. Dissert. Abstr.

N75-23984 Lehigh Univ., Bethlehem, Pa.
DENSIFICATION-MECHANISM MODELING OF THE PRESSURE-SINTERING BEHAVIOR OF MgAl2O4 Ph.D. Thesis
Richard Henry Smoak 1974 220 p
Avail: Univ. Microfilms Order No. 75-10375

A study of the pressure-sintering densification kinetics of MgAl2O4 was performed within the temperature range of 1400 to 1550 C and the pressure range of 5,000 to 10,000 psi. The results were analyzed in terms of the phenomenological models of Murray, et al., and of Wolfe. The densification rate equation of Murray, et al., derived from a consideration of Newtonian-viscous densification behavior, was found to be inadequate as a model for the densification behavior of MgAl2O4. The Wolfe rate equation, based on nonviscous densification behavior, provided good agreement between predicted and experimentally observed densification rates. An iterative solution technique was devised to determine the effective stress exponent which best fit the experimental behavior. These stress exponents were in the range 1 to 2 depending upon the temperature and applied pressure of the experiment and upon the particular stress correction term used in the analysis. Dissert. Abstr.

N75-23985*# Battelle Columbus Labs., Ohio.
FABRICATION AND EVALUATION OF AN OSO-1 TYPE BASEPLATE Final Report
C. W. Marschall 6 May 1975 46 p refs
(Contract NAS5-11411)
(NASA-CR-143794) Avail: NTIS HC $3.75 CSCL 13E

An OSO-1 type baseplate of a low thermal-expansion glass-ceramic material was evaluated for its dimensional stability after exposure to thermal cycling and mechanical vibration. The results indicate that baseplates of relatively simple design can be successfully cast and machined, although the demonstration article produced deviated somewhat from design specifications. It is likely that baseplates of more sophisticated designs and improved structural efficiency also can be prepared from low thermal expansion material. Author

N75-23986*# Battelle Columbus Labs., Ohio.
FABRICATION OF EXPERIMENTAL THREE-METER SPACE TELESCOPE PRIMARY AND SECONDARY MIRROR SUPPORT STRUCTURE Final Report, Jul. 1971 - Feb. 1974
H. W. Mishler 31 Jul. 1974 15 p
(Contract NAS5-11499)
(NASA-CR-143796) Avail: NTIS HC $3.25 CSCL 13E

The fabrication of prototype titanium alloy primary and secondary mirror support structures for a proposed experimental three-meter space telescope is discussed. The structure was fabricated entirely of Ti-6Al-4V tubing and plate. Fabrication included the development of procedures including welding, forming, and machining. Most of the structures was fabricated by gas-shielding tungsten-arc (GTA) welding with several major

components fabricated by high frequency resistance (HFR) welding. Author

N75-23987*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A UNIQUE CONCEPT FOR AUTOMATICALLY CONTROLLING THE BRAKING ACTION OF WHEELED VEHICLES DURING MINIMUM DISTANCE STOPS
Donald E. Barthlome May 1975 34 p refs
(NASA-TM-X-72665) Avail: NTIS HC $3.75 CSCL 13L

Test results of a unique automatic brake control system are outlined and a comparison is made of its mode of operation to that of an existing skid control system. The purpose of the test system is to provide automatic control of braking action such that hydraulic brake pressure is maintained at a near constant, optimum value during minimum distance stops. Author

N75-23988*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GRAPHITE FLUORIDE LUBRICATION: THE EFFECT OF FLUORINE CONTENT, ATMOSPHERE, AND BURNISHING TECHNIQUE
Robert L. Fusaro 1975 27 p refs Proposed for presentation at the Lubrication Conf., Miami, Fla., 21-23 Oct. 1975; Sponsored by ASME and Amer. Soc. of Lubrication Engr.
(NASA-TM-X-71733; E-7492) Avail: NTIS HC $3.75 CSCL 11H

Eight different graphite fluoride compounds with fluorine to carbon ratios varying from x = 0.25 to 1.1 were evaluated as burnished films in order to determine the effect of fluorine content on the solid lubricant properties of graphite fluoride. For comparison, similar experiments were conducted on graphite burnished films. It was found that even a small amount of fluorine in graphite fluoride (CF sub 0.25) sub n improved the lubricating properties of graphite. Such factors as burnishing atmosphere, burnishing technique, test atmosphere, and specimen temperature affected the results as much as varying the fluorine to carbon ratio of the compound. Best life was found for films that were machine-burnished in moist air and tested in moist air. Author

N75-23989*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURVEY OF COATINGS FOR SOLAR COLLECTORS
G. E. McDonald 1974 5 p ref Presented at the Workshop on Solar Collectors for Heating and Cooling of Buildings, New York, 21-23 Nov. 1974; Sponsored by NSF
(NASA-TM-X-71730; E-8355) Avail: NTIS HC $3.25 CSCL 11C

Ceramic enamel is found to be more solar selective, (i.e., has high solar absorptance in combination with low infrared emittance) than organic enamel, but neither is as solar selective as black chrome, black copper, black zinc, or black nickel. Ceramic enamel is matched only by black chrome in durability and wide availability. Ceramic enamel and organic enamel have approximately the same cost, and both are currently slightly lower in cost than black chrome, black copper, or black zinc. Black nickel is relatively unavailable and, because of that, realistic cost comparisons are not possible. Author

N75-23990*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF LONGITUDINAL SURFACE FINISH ON ELASTOHYDRODYNAMIC LUBRICATION
Thomas A. Dow (Battelle-Columbus Labs., Ohio), Jerrold W. Kannel (Battelle-Columbus Labs., Ohio), and Richard J. Parker Washington Jun. 1975 37 p refs
(NASA-TN-D-7967; E-7971) Avail: NTIS HC $3.75 CSCL 13I

The effect of longitudinal-lay surface finish on the elastohydrodynamic film thickness and the percentage of film between rolling disks in contact were evaluated using a rolling disk apparatus. Film thickness was measured by transmitted X-rays, and percentage of film was monitored by an alternating-current continuity circuit. Disk finish was varied on both the crowned upper disk and the cylindrical lower disk. A type-2 ester and a synthetic paraffinic oil were used as lubricants. It was shown that the roughness with longitudinal lay has a deleterious effect on both film thickness and percentage of film. Measured film thicknesses for the two lubricants were comparable at equivalent test conditions. The percentage of film where a change in surface topography was observed was approximately 20 percent for the synthetic paraffinic oil and 10 percent for the type-2 ester. Author

N75-23991# Imperial Coll. of Science and Technology, London (England). Lubrication Lab.
THE BACKGROUND TO CURRENT THEORIES OF SCUFFING
P. B. MacPherson, ed. Min. of Defence 1974 109 p refs Sponsored by Min. of Defence Prepared for Westland Helicopters Ltd., Yeovil, Engl.
(S/T-Memo-5/73; BR33386) Avail: NTIS HC $5.25

Lubricant failure problems reviewed in literature were examined as a background for further experimental investigations. Elastohydrodynamic lubrication in line contact, lubrication breakdown under boundary conditions, action of oil additives, and metallurgical aspects of scuffing are detailed. For individual titles, see N75-23992 through N75-23995.

N75-23992 Imperial Coll. of Science and Technology, London (England). Lubrication Lab.
ELASTOHYDRODYNAMIC LUBRICATION IN LINE CONTACT
D. G. Wymer *In its* The Background to Current Theories of Scuffing 1974 p 2-53 refs (For availability see N75-23991 15-37)

Theoretical analyses and experimental work on elastohydrodynamic lubrication of gears in line and point contact are reviewed. Elastohydrodynamic film thickness and shape were calculated from resistivity, voltage discharge, capacitance, X-ray transmission, and magnetic and optical interferometry methods. Pressure and temperature at the contact were measured scaling up the size of the contact and using miniature transducers. Non-Newtonian behavior and lubricant starvation problems were also examined. ESRO

N75-23993 Imperial Coll. of Science and Technology, London (England). Lubrication Lab.
LUBRICATION BREAKDOWN UNDER BOUNDARY CONDITIONS
M. W. Bailey *In its* The Background to Current Theories of Scuffing 1974 p 54-73 refs (For availability see N75-23991 15-37)

From experiments with lubricants containing fatty acids, a theory of adsorbed polar surface layers was developed for boundary lubrication. As a consequence, thermodynamic properties of boundary lubrication were defined, and work was performed for predicting impending failure of boundary lubricated mechanical systems. From lubricant failure in sliding contact experimentation, a critical temperature hypothesis was developed as sharp transitions from low to high friction occur. In most cases the failure of a nonreactive mineral lubricant is due to excessive thermal conditions. ESRO

N75-23994 Imperial Coll. of Science and Technology, London (England). Lubrication Lab.
THE ACTION OF OIL ADDITIVES
H. A. Spikes *In its* The Background to Current Theories of Scuffing 1974 p 74-91 refs (For availability see N75-23991 15-37)

Extreme pressure lubricants were designed to react only when temperatures are reached such that normal, oily boundary lubrication breaks down. They prevent continual corrosion of the metal surface, and contain compounds of S, P, Cl, I liable to react with metal surfaces under boundary conditions. Radiochemical analysis, electron probe microanalysis, and correlation of lubricant properties and chemical structure and concentration were used for investigating mechanisms of action. Temperature, sliding load, and speed on extreme pressure activity were also investigated. ESRO

N75-23995 Imperial Coll. of Science and Technology, London (England). Lubrication Lab.
METALLURGICAL ASPECTS OF SCUFFING
A. A. Torrence *In its* The Background to Current Theories of Scuffing 1974 p 92-104 refs (For availability see N75-23991 15-37)

White or yellow nonetching layers are formed on iron or steel surfaces rubbed together under dry or badly lubricated conditions. Experiments were performed to establish the nature of the white layers, but some uncertainty reigns both on their origin and on their resulting beneficial or noxious effect in sliding. The possibility that these layers are strain hardened layers, martensitic layers, carburized layers, or amorphous material is discussed.
ESRO

N75-23996# Sandia Labs., Albuquerque, N.Mex.
SPHEROIDIZATION OF NORMAL AND DEUTERATED POLYETHYLENE
T. S. Prevender Dec. 1974 12 p refs
(Contract AT(29-1)-789)
(SAND-74-0318) Avail: NTIS HC $3.25

A process was devised for making solid spherical particles of both normal and deuterated polyethylene Spheres with diameters in the range of 10 to 10,000 microns were made using this process. Author (NSA)

N75-23997# British Petroleum Co., Ltd., Sunbury-on-Thames (England).
DEVELOPMENT OF NEW SPACE LUBRICANTS
G. C. Friend, A. J. Groszek, W. A. Ware, and M. Warwick Paris ESRO 1975 29 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975 Prepared jointly with RAE and Marconi Space and Defence Systems Ltd.
Avail: NTIS HC $3.75

A description is given of the development of special mineral and synthetic ester oils and two greases produced from these oils containing a oleophilic graphite/lead composite. A series of torque and wear tests in vacuum were run in comparison with existing space lubricants, and similar tests are at present running using minature bearings through a range of conditions. Two despun antenna drives using the lubricants are at present running in vacuum. These lubricants have applications in various satellite mechanisms and possibly other hostile environments.
Author (ESRO)

N75-23998# Cambridge Univ. (England). Cavendish Lab.
THE FRICTION AND WEAR OF SELF LUBRICATING POLYTHENES
B. J. Briscoe and D. Tabor Paris ESRO 1975 22 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Certain features of the friction, transfer and wear of two classes of polymer are outlined with particular reference to low density polythenes and high density polythenes. Two approaches are described which improve the tribological characteristics of each polymer. The friction of low density polythene is reduced by the addition of small quantities of oleamide into the bulk of the polymer. The amide migrates to the surface and acts as a boundary lubricant. The wear of high density polythene is reduced by the addition of lead oxides and copper oxides to the polymer during fabrication. The fillers appear to effectively bond a transferred layer of the polymer to certain counterfaces and this has the effect of reducing the wear rate. Author (ESRO)

N75-23999# National Engineering Lab., East Kilbride (Scotland).
SACRIFICIAL CAGE MATERIALS FOR THE IN-SITU LUBRICATION OF ROLLING BEARINGS
D. Scott and J. Blackwell Paris ESRO 1975 19 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Cage materials for in situ lubrication of rolling bearings under arduous service conditions were investigated by using an accelerated service simulation test. Polymeric materials, materials reinforced with glass and carbon fibers and containing MoS2, reduced or eliminated wear of rolling mechanisms of various materials including En31 steel, high speed tool steel, silicon nitride, and tungsten carbide with little sacrificial wear of the cage material. Composites of metals and solid lubricants were also effective. Generally, polymeric cage materials failed by fracture due to cracks initiating at voids formed during bearing operation, usually in areas of fiber depletion. The better performance of polytetrafluoroethylene (p.t.f.e.)-based material appears to be due to the stronger fiber/matrix bond and the smearing of p.t.f.e. on the rubbing surface. MoS2 appears to produce a smooth, low-friction surface and is beneficial. Uniform distribution of the fibers and good bonding aids satisfactory performance. The performance of metal/solid lubricant composites depends greatly upon their structure. Author (ESRO)

N75-24000# Les Applications de Roulement, Thomery (France).
ON THE EFFECTS OF SOLID LUBRICATION ON THE TORQUE OF A BALL BEARING
Jack C. Manon Paris ESRO 1975 16 p Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Two different coating methods were compared for one solid lubricant, i.e. molybdenum disulfide, from the standpoint of the torque of new bearings as well as from that of their reliability in an ultra-high vacuum environment. This work was carried out with a view to qualifying one of the mechanism for the French Satellite D2B. Results show that the torque can be greatly decreased and regulated by reducing the coating thickness, and that measuring the torque is quite a good way of appreciating, and thus keeping the evenness of the coating. The reliability of the coatings studied are similar, at least within the constraints of the mission considered. Author (ESRO)

N75-24001# National Aerospace Lab., Amsterdam (Netherlands).
A TEST RIG TO MEASURE THE THERMAL CONDUCTANCE AND FRICTION TORQUE OF BEARINGS IN VACUUM
J. F. Heemskerk, A. A. M. Delil, and J. P. B. Vreeburg Paris ESRO 1975 18 p ref Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
(Contract ESTEC-1679/72-PP)
Avail: NTIS HC $3.25

A test rig was designed and built in order to obtain experimental data on thermal conductance and generated friction heat of rotating bearings in vacuum. These data are of importance for the thermal balance of the mechanism. A concise description of the test rig is presented. Details of the rig are discussed and some preliminary test results obtained with the rig are given.
Author (ESRO)

N75-24002# Centre National de la Recherche Scientifique, Meudon (France).
FRICTION OF THE COUPLES COPPER-COPPER, MOLYBDENUM-MOLYBDENUM, COPPER-MOLYBDENUM AND COPPER-NICKEL IN THE ULTRAHIGH VACUUM [FROTTEMENT DES COUPLES CUIVRE-CUIVRE, MOLYBDENE-MOLYBDENE, CUIVRE-MOLYBDENE, ET CUIVRE-NICKEL DANS L'ULTRA-VIDE]
Michel Barquins, Daniel Maugis, and Robert Courtel Paris ESRO 1975 18 p refs In FRENCH Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

The friction of the couples copper-copper, molybdenum-molybdenum, copper-molybdenum, and copper-nickel was investigated in ultrahigh vacuum as a function of the temperature and the partial oxygen pressure. In vacuum, the Mo-Mo couple frictionizes better than the couple Cu-Cu; at 300 C, 900 l of oxygen are necessary to reduce the friction coefficient Cu-Cu, and only 200 l in the case of Mo-Mo. The couples Mo/Cu (with Mo as frictionizer) and Cu/Mo present a different high temperature behavior. The friction coefficient Cu/Mo increases rapidly with temperature, whereas for Mo/Cu it goes through a flat minimum to 500 C. A similar behavior was observed for Ni/Cu and Cu/Ni. The activation energy of high temperature friction corresponds to that of the superficial self diffusion of Cu : Qs = 13 Tf cal/mole. Author (ESRO)

N75-24003# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands).
GREASE LUBRICATED SPIRAL GROOVE BEARINGS FOR LONG-LIFE SYSTEMS
E. A. Muyderman Paris ESRO 1975 47 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.75

Investigations of grease lubricated spiral groove bearings were reviewed and some results are reported. The work was aimed at finding a type of bearing with high reliability and a long life. Research was, in particular, carried out on a satellite attitude control momentum wheel running on these bearings. Topics discussed are the circulation of grease, the calculation of the design dimensions aimed at an optimum stability, load capacity, and friction. Values for life times of a few experimental types of momentum wheel bearing systems are presented.
ESRO

N75-24004# Institut National des Sciences Appliquees, Villeurbanne (France). Lab. de Mecanique des Contacts.
THIRD BODY FORMATION AND ELIMINATION ON CARBON FIBER EPOXY COMPOSITE
D. Play and M. Godet Paris ESRO 1975 18 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Friction tests were performed with steel rings against a carbon fiber resin composite. Results show that in hertzian contacts (ring-flat) a transfer film or third body coats only the moving ring. In distributed contacts (ring-sector) the same transfer film is observed on the ring but the fixed sector is coated with a third body different in nature. Third bodies can be stable or unstable. They modify the friction force and control wear. Thus general friction characteristics of a given material cannot be obtained from tests run on a single type of machine.
Author (ESRO)

N75-24005# Centre National d'Etudes Spatiales, Toulouse (France).
COMPOSITE SELF LUBRICATING MATERIALS FOR SPACE APPLICATIONS [MATERIAUX COMPOSITES AUTO LUBRIFIANTS POUR UTILISATIONS SPATIALES]
M. Roussel, C. Martin (Inst. Natl. de Rech. Chim. Appl.), and J. Sailleau (Inst. Natl. de Rech. Chim. Appl.) Paris ESRO 1975 44 p refs In FRENCH Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.75

Wear tests were carried out on polyimide resins and various additives serving as lubricants. The best materials were characterized by different tests: wear and friction in air, wear in ultrahigh vacuum, and behavior in vacuum. The transfer film obtained by friction and wear of the composites on a metal part was investigated. Results for wear and the coefficient of friction are given for different loadings and different speeds as a function of time. The effects of temperature and surface roughness were also studied. A material based on polyimide, polytetrafluoroethylene and molybdenum disulfide shows the best results. The practical application of these self lubricating composites is primarily for ball bearing cages. Functional tests of bearings in air and ultrahigh vacuum are satisfactory. ESRO

N75-24006# Centre National d'Etudes Spatiales, Toulouse (France).
METHOD FOR CONTINUOUS TORQUE MEASUREMENT OF DRY MINIATURE BEARINGS [METHODE DE CONTROLE DE COUPLE EN CONTINU DE ROULEMENTS SECS MINIATURES]
E. Conde Paris ESRO 1975 9 p In FRENCH Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

A method for continuously measuring the friction torque of a pair of ball bearings, using a microbalance, is described. Tests of this method were carried out on bearings with duroide cages showing an identical quality of American and French products. A second result is the improvement of the duration of rotation in the absence of moisture and oxygen, which were substituted by an Argon atmosphere. ESRO

N75-24007# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Centre Technique.
RESEARCH AND DEVELOPMENT IN THE FIELD OF SPACECRAFT MECHANICAL DEVICES [RECHERCHES ET DEVELOPPEMENT DANS LE DOMAINE DES MECANISMES SPATIAUX]
P. Poubeau Paris ESRO 1975 24 p In FRENCH Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Work on bearings for mechanical devices rotating at low speeds (1 revolution/1 day) is reported. Pivots were developed, manufactured from hard materials and rotating on polyimide bearings. Variations of these materials can be used to achieve current collector rings, and tests and results obtained are described. The materials applied show considerable advantages: no cold soldering between parts in contact; no blocking or seizure even in presence of particles; and no large variation in resisting torque. ESRO

N75-24008# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Munich (West Germany). Inst. fuer Flugtreib- und Schmierstoffe.
A DRY LUBRICATION SYSTEM FOR SPACEPROOFED BEARINGS
Eilhard Jantzen Paris ESRO 1975 25 p Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

A review is given of work conducted during a number of years in the field of dry lubrication for ball bearings in space applications. Testing methods to provide preselection of coatings and retainer material are reported. Investigations were made to elucidate the behavior of bearings in ultrahigh vacuum during accelerated tests, long-term mission tests, and thermal tests. The influence of temperature gradients on the friction characteristics of the HELIOS Design Drive Assembly was studied.
Author (ESRO)

N75-24009# Institut Franco-Allemand de Recherches, St. Louis (France).
EFFICIENCY OF STEEL FRAGMENTS ON THIN DURALUMIN TARGETS [EFFICACITE DES ECLATS D'ACIER SUR DES CIBLES MINCES DE DURALUMIN]
G. Herbette, F. Jamet, and J. P. Hancy 26 Mar. 1974 61 p refs In FRENCH
(Contract CEG-403/058/22)
(ISL-12/74) Avail: NTIS HC $4.25

The efficiency of steel projectiles impacting on thin duralumin targets at normal incidence is evaluated measuring the residual velocity of the projectile after the perforation. Experimental results at two velocity ranges: 3000 to 4000 m/s and 500 to 1500 m/s are reported. Theoretical relations giving the residual velocity as function of various parameters are reviewed and empirical relations to determine with high precision the same residual velocity are given. A critical velocity around 3200 m/s above which the projectile is pulverized after impact is determined. The effect of projectile mechanical resistance on efficiency is emphasized at lower velocities. Tests carried out using two successive targets distant 0,5, and 20 mm have shown that the residual velocity is the intense function of the distance between targets. ESRO

N75-24010# Bell Helicopter Co., Fort Worth, Tex.
DURABILITY OF ADHESIVE BONDED JOINTS Final Technical Report, 28 Jun. 1971 - 1 Mar. 1974
Tom B. Frazier and Abel D. Lajoie Mar. 1974 434 p
(Contract F33615-71-C-1668; AF Proj. 7381)
(AD-A007873; AFML-TR-74-26) Avail: NTIS CSCL 13/5

The purpose of the program was to develop data on the mechanical properties of adhesives in metal-to-metal, composite-to-composite, and honeycomb bonds and to investigate the influence of various adherend surface preparation methods on mechanical properties. GRA

N75-24011# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
WATER-BASE COATINGS Final Report, 16 Jul. 1973 - 15 Jul. 1974
Mohamed S. El-Aasser, Joseph D. Hoffman, Charles Kiefer, Henry Leidheiser, Jr., John A. Manson, Gary W. Poehlein, Richard Stoisits, and John W. Vanderhoff Nov. 1974 116 p refs
(Contract F33615-73-C-5179)
(AD-A007851; AFML-TR-74-208-Pt-1) Avail: NTIS CSCL 11/3

The purpose of this work was to develop water-based analogs of existing solvent-based epoxy primer and polyurethane topcoat systems. The approach was to prepare aqueous emulsions of both epoxy and polyurethane system components using the anionic sodium lauryl sulfate-cetyl alcohol or cationic hexadecyltrimethyl-ammonium bromide-cetyl alcohol combinations as emulsifier. Fluid, stable anionic and cationic emulsions of the epoxy resin dissolved in solvents were prepared using the mixed emulsifier combination and simple stirring, followed by ultrasonic irradiation or homogenization. The solvent-stripped epoxy resin and curing agent emulsions were mixed in various proportions and cured at room temperature or 50C. For preparation of polyurethane emulsions, the isocyanate prepolymer was pre-reacted to give adducts that were emulsified using the anionic mixed emulsifier combination and simple stirring, followed by ultrasonic irradiation or homogenization. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-24012 Brigham Young Univ., Provo, Utah.
ALCOHOL ASSISTED HYDROCARBON FUELS: A COMPARISON OF EXHAUST EMISSIONS, POWER OUTPUT AND FUEL CONSUMPTION USING STATIC AND DYNAMIC ENGINE TEST FACILITIES Ph.D Thesis
Dwight J. Bushnell 1975 143 p
Avail: Univ. Microfilms Order No. 75-11272

Experimental data are presented which show the differences in emission-level testing on internal combustion engines when dynamic engine tests are used. A comparison of the dynamic engine and steady-state engine test methods is made using hydrocarbon fuels with varying amounts of methanol. Emissions measured include the nitric oxides, unburned hydrocarbons and carbon monoxide. Power output and fuel consumption are reported for the various volumetric percentages of methanol in the fuel. Of special significance are the different trends the emission levels establish when subjected to a dynamic engine test as compared to the results for the steady-state tests. Dissert. Abstr.

N75-24013 Paris Univ. (France). Lab. de Physique des Solides.
CHARACTERIZATION OF IMPLANTED SILICON BY RAMAN AND INFRARED SPECTROCOPY Final Report [CARACTERISATION DU SILICIUM IMPLANTE PAR SPECTROSCOPIES INFRAROUGE ET RAMAN]
C. Sebenne, R. Beserman, and M. Balkanski May 1974 48 p refs In FRENCH
(Contract DGRST-72-7-0540)
Avail: Issuing Activity

Nondestructive optical methods to characterize ion implanted silicon are discussed. In the first method the infrared reflectance spectrum is calculated as a function of frequency near the plasma frequency of an inhomogeneously doped semiconductor the free carrier concentration profile is introduced as a curve depending on four parameters. These are determined by comparison of the theoretical and experimental reflectance graphs. The theoretical curve sensitivity to the various parameters is discussed showing that, in a given range of concentrations, the sensitivity of the method increases with concentration. In the second method the nature and depth of the perturbed layer is studied by RAMAN diffusion as a function of mass and concentration of implanted ions. Defect curing and position of light ions were determined by measurement of phonon intensity (normal and localized) as a function of annealing temperature. ESRO

N75-24014*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIFFUSION LENGTH MEASUREMENTS USING THE SCANNING ELECTRON MICROSCOPE
V. G. Weizer 1975 7 p refs Presented at the 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; Sponsored by IEEE
(NASA-TM-X-71724) Avail: NTIS HC $3.25 CSCL 09A

A measurement technique employing the scanning electron microscope is described in which values of the true bulk diffusion length are obtained. It is shown that surface recombination effects can be eliminated through the application of highly doped surface field layers. The influence of high injection level effects and low-high junction current generation on the resulting measurement was investigated. Close agreement is found between the diffusion lengths measured by this method and those obtained using a penetrating radiation technique. Author

N75-24015# Centre National d'Etudes Spatiales, Toulouse (France).
PRESENTATION OF TESTS ON GEARS PERFORMED AT CNES [PRESENTATION DES ESSAIS D'ENGRENAGES FAITS AU CNES]
E. Conde Paris ESRO 1975 25 p In FRENCH Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Tests are reported on couples of metal gear wheels without lubrication in order to validate test methods and to evaluate wear. The metal-metal couple can support heavy loads, but a lubricating teflon layer is necessary to avoid micro solderings and surface degradation, which could lead to inadmissible torques. The plastic-plastic couple is not very useful for a reducing wheel for which the pinion is small compared to the wheel. The plastic-metal couple is presently the best solution with respect to the torques normally transmitted in space applications. ESRO

N75-24016# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
THE EVALUATION OF NiCd CELL COVERS. PART 1: TEXT AND TABLES Final Report
W. J. VanderVet and E. A. B. DeGraaf Aug. 1974 33 p 2 Vol.
(Contract ESTEC-2019/73)
(NLR-TR-74116-C-PT-1; ESRO-CR(P)-610) HC $3.75

The evaluation program on circular and rectangular NiCd cell covers in accordance with ESTEC specifications is described. The program includes a number of pretest and posttest analysis techniques such as dye-penetrant, leak tests, and X-ray radiography, as well as a series of mechanical strength tests such as pull-tests, pressure tests, and cyclic-pressure tests. Corrosion, stress corrosion, and electro-corrosion tests were carried out in conditions simulating cell conditions. Only the circular covers were subjected to a pretest analysis and quick bond quality evaluation and pressure cycling tests. Both types of covers were subjected to corrosion tests and subsequent analysis. It is shown that the electro-chemical corrosion testing of the round covers proved to give best results for an evaluation test program. ESRO

N75-24017# National Aerospace Lab., Amsterdam (Netherlands).
THE EVALUATION OF NiCd CELL COVERS. PART 2: FIGURES Final Report
W. J. VanderVet and E. A. B. DeGraaf 1974 80 p 2 Vol.
(Contract ESTEC-2019/73)
(NLR-TR-74116-C-Pt-2; ESRO-CR(P)-611) Avail: NTIS HC $4.75

For abstract, see N75-24016.

N75-24018# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
DEVELOPMENT OF A BENCH PROCEDURE FOR EVALUATING THE EFFECTIVENESS OF DISPERSANT DETERGENT GASOLINE ADDITIVES, PHASE 2 Final Report
H. W. Marbach, Jr. and A. A. Johnston Dec. 1974 30 p refs
(Contract DAAK02-73-C-0221)
(AD-A006580; AFLRL-52) Avail: NTIS CSCL 14/2

This report covers work undertaken at the U.S. Army Fuels and Lubricants Research Laboratory to develop a laboratory bench procedure for the evaluation of dispersant-detergent gasoline additive effectiveness in controlling and/or inhibiting engine intake system disposition. The development of the synthetic crankcase off-gas liquid in Phase I of this project has made it possible to develop a bench procedure. A bench apparatus was designed,

built and developed as a testing tool that provides data that correlates to actual engine results in: (1) the carburetor throttle plate and throat area, (2) the induction system (port and valve areas), and (3) additive effectiveness. The apparatus is simple in design and operation, and provides the advantage of evaluating both carburetor and intake deposits simultaneously. GRA

N75-24019# Texas Highway Dept., Austin. Materials and Tests Div.
FIELD EVALUATION OF VOID SPACING INDICATOR Final Report
Billy N. Banister Feb. 1974 57 p refs
(PB-239044/1; THD-1-9-72-504-1F) Avail: NTIS HC $4.25 CSCL 13C

The field testing and procedures used to evaluate the Void Spacing Indicator (VSI) are discussed with regard to reliability in determining the void spacing in plastic concrete as mathematically related to the void spacing in hardened concrete. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-24020 Akron Univ., Ohio.
STATIC, VIBRATION, AND STABILITY ANALYSES OF ANISOTROPIC PLATES Ph.D. Thesis
Sawang Prachuktam 1974 200 p
Avail: Univ. Microfilms Order No. 75-10095

The numerical formulation and solution procedure is presented for the analysis of anisotropic rectangular plates with various boundary conditions. the formulation includes the linear theory of stability analysis, the calculation of natural frequencies and mode shapes, and the static analysis due to mechanical loadings. The governing plate equations were cast into the form of a system of first order partial differential equations, and the method of lines, which involves the discretization of one independent variable, was used to reduce system of equations to a system of first order ordinary differential equations. The fundamental matrices were determined by the multi-segment numerical integration procedure, and the solutions were obtained by employing a modified Gaussian elimination procedure. The effects of anisotropy on the behavior of plates for static, vibration, and buckling analyses are also given. Dissert. Abstr.

N75-24021 Illinois Univ., Urbana.
A PROBABILISTIC ANALYSIS OF STRUCTURAL RELIABILITY AGAINST FATIGUE AND FRACTURE Ph.D. Thesis
Richard Cramond, Jr. 1974 291 p
Avail: Univ. Microfilms Order No. 75-11606

The existing concepts of fatigue and fracture mechanics are used with the concept of extended reliability to obtain models for the structural reliability analysis and evaluation of welded pressure vessels. The process of fatigue leading to fracture failure is assumed to be made up of three stages; viz., the flaw sharpening and initiation, stable crack propagation, and unstable crack propagation stages. Probabilistic models are presented for each stage based on the concept of extended reliability to incorporate uncertainties associated with errors in modeling and parameter estimations. A method is also presented for the cumulative damage analysis for predicting the mean and variance of crack initiation life under random loading. This method applies Monte Carlo methods to the linear cumulative damage rule to obtain a set of nondimensionalized design curves. Dissert. Abstr.

N75-24022 Purdue Univ., Lafayette, Ind.
ESTIMATION OF STRUCTURAL DYNAMIC MODEL PARAMETERS FROM TRANSIENT RESPONSE DATA Ph.D. Thesis
Ronald Rodeman 1974 144 p
Avail: Univ. Microfilms Order No. 75-10951

A method is presented for the estimation of physically meaningful structural dynamic model parameters using transient response data. The parameter estimation was accomplished in two major steps. In the first step, an existing technique was improved and used to obtain an estimate of one or several frequency response functions associated with the system. The improvement was obtained by modifying the constraint on the possible candidates for the estimate of the impulse response function. This results in an improved agreement between the estimated and the exact solutions, and a reduced mean square error associated with the estimate. The parameters of the structural dynamic model were estimated by using the method of maximum likelihood as applied to this error. Several numerical examples are given to demonstrate the effectiveness of this approach, and a detailed investigation of a two-degree-of-freedom model indicates the accuracy with which the parameters may be obtained. Dissert. Abstr.

N75-24023 Purdue Univ., Lafayette, Ind.
A FINITE ELEMENT DISPLACEMENT APPROACH FOR THE ELASTO-PLASTIC ANALYSIS OF THIN CYLINDRICAL SHELLS Ph.D. Thesis
Roger James Wagner 1974 181 p
Avail: Univ. Microfilms Order No. 75-10978

An elasto-plastic analysis of thin cylindrical shells was carried out with the use of a curved shell element. The shell finite element was defined by specifying the geometry of the middle surface, degrees of freedom, displacement functions, and strain-displacement relations. Rigid-body terms are explicitly included in the displacement functions. Elastic-perfectly plastic material behavior is assumed, and the von Mises yield criterion was used to define the limit of elasticity. Initial (plastic) strain distributions and a distribution for an elastic-plastic boundary in the element are defined. Incremental stress-strain relations were developed for use in the plastic range, and displacements, stresses, strains, forces, and moments were determined for each increment of load. A program was developed to formulate and solve the governing matrix equation. A variety of examples are presented to demonstrate the validity and applicability of the method. Dissert. Abstr.

N75-24024 Michigan Univ., Ann Arbor.
NONLINEAR VIBRATION OF THREE-LAYER BEAMS Ph.D. Thesis
Michel William Hyer 1974 152 p
Avail: Univ. Microfilms Order No. 75-10189

The forced, nonlinear vibration of three-layer beams with dissimilar elastic outer layers and soft viscoelastic cores were studied. A force is produced by an electromagnet and is a constant bias plus a harmonic force. Because of the structural nonlinearity, the force is expected to produce a component of beam response at twice the forcing frequency. The equations governing the vibratory behavior of the beams are developed by using the principle of virtual work and by considering the beam equations as a special case of plate equations. The equations show the individual bending resistance of the elastic layers and the constitutive behavior of the core which is represented with a hereditary integral. Galerkin's method and harmonic balance are used to predict beam response. Considerable attention is given to the component of response at twice the forcing frequency. The serious effects electromagnetic forcing can have on the structure being forced are discussed. Results of beam response, using the feedback forcing system, are presented and the results compared to theoretical predictions. Dissert. Abstr.

N75-24025 Syracuse Univ., Utica, N.Y.
A NEW MODEL FOR THE THRESHOLD CONDITION FOR INITIATION AND PROPAGATION OF FATIGUE CRACKS Ph.D. Thesis
Dhirendra Narain Lal 1974 193 p
Avail: Univ. Microfilms Order No. 75-10551

Fatigue crack growth data in the low and intermediate stress ranges obtained from tests carried out on Al 2014-T6, Ti-6Al-4V and 250 grade maraging steel and similar raw data on Al 7075-T6 and Al 2024-T3 available from other investigations were analyzed using Weiss's fatigue model that contains a threshold condition for propagation of fatigue cracks. On the basis of this analysis, a new model for estimating the threshold stress intensity factor range is proposed which involves the concept of 'statistical

size effect' or 'volumetric strength effect' in the critically stressed volume of material surrounding the fatigue crack tip. It is hypothesized that, near the threshold, this volume is small enough to become 'defect free' like a whisker and to offer a local strength equal or close to the theoretical strength of the material.
Dissert. Abstr.

N75-24026 Ohio State Univ., Columbus.
VIBRATION ANALYSIS OF SKEWED CANTILEVER SYSTEMS: HELICOIDAL SHELLS AND PLATES Ph.D. Thesis
Dennis Paul Beres 1974 96 p
Avail: Univ. Microfilms Order No. 75-11313

Free vibration modes and frequencies were calculated for skewed cantilever systems, and certain helicoidal shells and the limiting case of the flat plate were investigated. Data are presented for all geometric parameters. Starting with the linear strain-displacement relations given by Novozhilov, the energy equation was obtained by means of Hamilton's 'Law of Varying Action'. Using the Ritz method with modified power series for the assumed functions, the standard eigenvalue problem results. Nodal patterns and frequencies of the first 5 modes of each parameter combination are given. In the case of the helicoidal shell, convergence curves are presented to establish the validity of the numerical results. In the case of the flat plate, comparison to other analytical and experimental data is given.
Dissert. Abstr.

N75-24027 Wisconsin Univ., Madison.
INVESTIGATION OF CONTACT BETWEEN GROUND SURFACES THROUGH CONTINUOUS TIME SERIES MODEL Ph.D. Thesis
Pramod Tulsidas Suratkar 1974 160 p
Avail: Univ. Microfilms Order No. 75-7610

The phenomenon was investigated of contact between two rough surfaces, from their topographical properties, along with the behavior of contact in terms of the machining conditions under which the surfaces were generated. The contact model is considered as an equivalent rough surface in contact with an ideally flat surface. The rough surface was represented by a single continuous profile, with Gaussian distribution for heights and the flat surface by a straight line. The surface was assumed to be isotropic. The ground surface was mathematically modelled, using the continuous time series. The grinding process was postulated as a linear stochastic feedback system, with the surface profile as its output. The formulation of the system is given both in terms of differential equation, which is used for physical interpretation, and difference equation, for optimal estimation of model parameters from profile measurement data. The parameters of the surface model reflect the grinding conditions.
Dissert. Abstr.

N75-24028 Ecole Polytechnique, Paris (France). Lab. de Mecanique des Solides.
FRACTURE MECHANICS OF METALLIC STRUCTURES Final Report [ETUDE DE LA MECANIQUE DE LA RUPTURE DES STRUCTURES METALLIQUES]
1 Jun. 1974 9 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2885)
Avail: Issuing Activity

The stress intensity factors were evaluated by means of weight functions. New path-independent integrals were found. The stress intensity factors for plates and shells were defined. The extent of the plastic zone as a function of load was determined. Methods for forecasting crack propagation under cyclic loads are given.
ESRO

N75-24029 Institut National Polytechnique, Nancy (France). Lab. de Metallurgie.
PERFORMANCE IMPROVEMENT OF ALUMINUM AND TITANTIUM BASED ALLOYS BY NEW TEMPERING METHODS FOR COOLING ACCELERATION AND REDUCTION OF RESIDUAL STRESSES Final Report [AUGMENTATION DES PERFORMANCES DES ALLIAGES A BASE DE TITANE ET D'ALUMINIUM A L'AIDE DENOUVEAUX PROCEDES DE TREMPE QUI PERMETTENT A LA FOIS D'ACCELERER LE REFROIDISSEMENT ET DE MINIMISER LES CONTRAINTES]
R. Faivre, G. Beck, and J. C. Chevrier 10 Apr. 1974 49 p refs In FRENCH
(Contract DGRST-72-7-0693)
Avail: Issuing Activity

The determination of temperature distribution during water tempering of Al and Ti alloy cylinders was performed by a method based on fast thermal analysis with interpolation between measured points. From the thermal data the strain variation during cooling and residual tempering stresses were calculated. A new method designed to modify the time evolution of the stresses with a view to reducing residual stresses is described and interpreted. The method was applied to six Al alloys and two Ti alloys. The responsible parameters for high residual stresses are identified.
ESRO

N75-24030 Compagnie de Saint Gobain (France). Lab. du Centre Europeen de Recherches et d'Essais
STUDY ON THE BEHAVIOR OF LAYERED GLASS-RESIN UNDER DYNAMIC LOAD (FATIGUE) Final Report [ETUDE DU COMPORTEMENT DES STRATIFIES VERRERESINE SOUS CONTRAINTE DYNAMIQUE (FATIGUE)]
Jean Durand, Maxime Manera, and Jacques Boissier Mar. 1973 37 p In FRENCH
(Contract DGRST-71-7-3113)
Avail: Issuing Activity

Results of fatigue tests on glass resin composite materials are presented. It is shown that the surface temperature and the dynamic modulus of elasticity change abruptly just before the dynamic rupture. The statistical residual rupture resistance undergoes a rather fast drop of 10 to 20% and remains unchanged until a short number of cycles before rupturing. Between 300 and 1000 cycles/min, the frequency has no influence on the number of cycles up to rupturing. Finally, the Wohler curves show that for the type of materials studied there is no endurance limit; it is therefore necessary to define a conventional limit of 10 million cycles.
ESRO

N75-24031# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
FATIGUE PROPERTIES OF AIRCRAFT LUGS WITH INTERFERENCE FIT
Alfred Buch Feb. 1975 62 p refs
(TAE-243) Avail: NTIS HC $4.25 CSCL 13E

Fatigue tests were carried out on aluminum alloy lugs with different hole diameters and configurations. A strong improvement in fatigue properties was observed in cases of relative intereference fits larger than 0.2%. The effect of the stresses produced by the interference fit were theoretically analyzed and the critical stress level, below which the interference fit has a beneficial effect, was determined. A method for evaluation of the fatigue life of interference-fit aluminum lugs is proposed.
Author

N75-24032*# Boeing Aerospace Co., Seattle, Wash.
DESIGN AND FABRICATION OF RENE 41 ADVANCED STRUCTURAL PANELS
Bruce E. Greene and Russell F. Northrup [1975] 59 p refs
(Contract NAS1-10749)
(NASA-CR-132646) Avail: NTIS HC $4.25 CSCL 13M

The efficiency was investigated of curved elements in the design of lightweight structural panels under combined loads of axial compression, inplane shear, and bending. The application is described of technology generated in the initial aluminum program to the design and fabrication of Rene 41 panels for subsequent performance tests at elevated temperature. Optimum designs for two panel configurations are presented. The designs are applicable to hypersonic airplane wing structure, and are designed specifically for testing at elevated temperature in the hypersonic wing test structure located at the NASA Flight Research Center. Fabrication methods developed to produce the Rene panels are described, and test results of smaller structural element specimens are presented to verify the design and fabrication methods used. Predicted strengths of the panels under several proposed elevated temperature test load conditions are presented.
Author

N75-24033# Royal Aircraft Establishment, Farnborough (England).
RESIDUAL STRESSES IN NOTCHES PRODUCED BY

VARIABLE OPERATIONAL LOADS AND THEIR IMPORTANCE FOR THE APPLICATION OF THE LINEAR CUMULATIVE DAMAGE HYPOTHESIS
D. Schutz Mar. 1975 75 p refs
(RAE-Lib-Trans-1800; BR47149) Avail: NTIS HC $4.25

The linear cummulative damage hypothesis was used to calculate the allowable stresses on structural members for which fatigue strength is the dimensional criterion. The endurance of the structural element under block programmed loading (which is similar to the actual operational loading) was calculated from the life under constant amplitude loading (loading that fluctuates between constant limiting values). The hypothesis yields estimated values for the endurance with a spread ranging from values on the safe side to values on the unsafe side. Attempts to explain these incorrect life estimates assume, on the basis of model representations, that the main cause lies in the residual stresses which were formed at a position of high stress concentration by local yielding. The residual stresses in notched bars made from light metal alloys AlCuMg2 and AZ 74/72 were measured in the notch root during the initial part of the life. Author

N75-24034# Communications Research Centre, Ottawa (Ontario). Space Technology Branch.
A STRUCTURAL DYNAMICS MODEL FOR FLEXIBLE SOLAR ARRAYS OF THE COMMUNICATIONS TECHNOLOGY SATELLITE
F. Vigneron Apr. 1975 37 p refs
(CRC-1268) Avail: NTIS HC $3.75

A mathematical model, which describes the structural mechanics of flexible solar arrays of the Communications Technology Satellite (CTS) in a ground test configuration, was developed using variational principles and continuum mechanics methods. Modes and frequencies for an array with CTS parameters were calculated for the one-g test state, and compared to corresponding ones for the zero-g on-orbit state. Calculated results are compared with ground test data; good agreement is noted for the major structural frequencies and modes. The test results show that modal frequencies may be excited by subharmonic excitation; this feature would necessitate a nonlinear vibrational model, and is not accounted for in the mathematical model. Alternate mathematical models based on finite element and continuum mechanics methods, which were developed for the design phase of the CTS program, are discussed. Author

N75-24035*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THERMAL LOADING IN THE LASER HOLOGRAPHY NONDESTRUCTIVE TESTING OF A COMPOSITE STRUCTURE
H. K. Liu (Alabama Univ., Tuscaloosa) and R. L. Kurtz Washington May 1975 24 p refs
(NASA-TR-R-439; M-133) Avail: NTIS HC $3.25 CSCL 11D

A laser holographic interferometry method that has variable sensitivity to surface deformation was applied to the investigation of composite test samples under thermal loading. A successful attempt was made to detect debonds in a fiberglass-epoxy-ceramic plate. Experimental results are presented along with the mathematical analysis of the physical model of the thermal loading and current conduction in the composite material. Author

N75-24036# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE EFFECT OF A PRESSURE WAVE ON A SPHERICAL SHELL
E. G. Ianiutin [1974] 4 p refs Transl. into ENGLISH from Teoretich. i Priklad. Mekhan, (Kiev), no. 5, 1974
Avail: NTIS HC $3.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The equations of motion of a spherical shell for a Timoshenko-type theory are presented and written in a spherical coordinate system with the coordinate angles, theta, phi. Bending moments, tensile forces, Laplace transformation, wave fronts, transverse forces, and numerical analysis are also discussed. M.J.S.

N75-24037*# Structures Research Associates, Laguna Beach, Calif.
COMPUTER ANALYSIS OF MULTICIRCUIT SHELLS OF REVOLUTION BY THE FIELD METHOD Final Report
Gerald A. Cohen Washington NASA Jun. 1975 51 p refs
(Contract NAS1-12764)
(NASA-CR-2535) Avail: NTIS HC $4.25 CSCL 13M

The field method, presented previously for the solution of even-order linear boundary value problems defined on one-dimensional open branch domains, is extended to boundary value problems defined on one-dimensional domains containing circuits. This method converts the boundary value problem into two successive numerically stable initial value problems, which may be solved by standard forward integration techniques. In addition, a new method for the treatment of singular boundary conditions is presented. This method, which amounts to a partial interchange of the roles of force and displacement variables, is problem independent with respect to both accuracy and speed of execution. This method was implemented in a computer program to calculate the static response of ring stiffened orthotropic multicircuit shells of revolution to asymmetric loads. Solutions are presented for sample problems which illustrate the accuracy and efficiency of the method. Author

N75-24038# Hanford Engineering Development Lab., Richland, Wash.
IRRADIATION EFFECTS ON REACTOR STRUCTURAL MATERIALS Semiannual Progress Report, Feb. - Jul. 1974
T. T. Claudson, comp Oct. 1974 390 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-74-51) Avail: NTIS HC $10.25

Results of research on radiation damage in reactor materials and on properties of reactor materials are presented. Topics discussed include fatigue and creep fatigue behavior of irradiated and unirradiated 304 and 308 SS, proton and neutron irradiation, reactor metals, materials performance, high strain rates, fuel cladding processes, corrosion behavior, electron beam characterization and electron irradiation, controlled thermonuclear reactor program, ion bombardment, and radiation effects. M.J.S.

N75-24039# Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).
DETERMINATION OF TRANSVERSE WELD YIELD STRENGTH ON THIN PLATE
C. Appel Mar. 1974 51 p refs
(AMSR.0039.74) Avail: NTIS HC $4.25

A method for the determination of the transverse weld yield strength on thin plates, using strain gage measurements on the weld and computer analysis, was developed. The value obtained is, by approximation, independent of the weld shape and of the specimen shape. The accuracy of the value obtained was increased by a more extended computer program in which, through iteration of the characteristic values of the assessed stress-strain curve of the all weld material, the calculated curve for the top of the weld is made equal to the curve measured at the top of the weld. The spread in the values formed after correction is mainly caused by influences inherent in the welding process and the weld material. ESRO

N75-24040# Transport and Road Research Lab., Crowthorne (England).
ON AN APPROXIMATE YIELD CRITERION FOR THIN STEEL SHELLS
M. A. Crisfield 1974 28 p refs
(PB-239166/2; TRRL-LR-658) Avail: NTIS HC $3.75 CSCL 11F

A modification is proposed for Llyushin's approximate yield criterion for thin shells. This modification makes the yield criterion more suitable for use in the collapse analysis of thin steel plates and shells under buckling loads. GRA

N75-24041# Notre Dame Univ., Ind. Coll. of Engineering.
INELASTIC RESPONSE OF RING-STIFFENED CYLINDRICAL SHELLS TO EXTERNAL PRESSURE SHOCK WAVES
L. H. N. Lee and J. T. Horng Mar. 1975 65 p refs
(Contract N00014-68-A-0152; NR Proj. 260-112)
(AD-A007329; UND-75-1) Avail: NTIS CSCL 13/10

An incremental finite-differences approach based on an absolute minimum principle in dynamic finite plasticity is developed to study the inelastic response of ring-stiffened cylindrical shells to underwater explosions. The pressure in the shock wave caused by an underwater explosion is treated as a prescribed transient

load acting on a shell. Numerical results for five cases are presented. The results indicate that dynamic stress concentrations and yielding occur in the shell near the ring stiffeners or other hard points. GRA

N75-24042# Air Force Technical Applications Center, Washington, D.C. Foreign Technology Div.
NUMERICAL SOLUTION OF THE AXISYMMETRIC TASKS OF CREEP OF CIRCULAR CYLINDRICAL SHELLS
G. N. Zamula 24 Jan. 1975 30 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 3, 1971 p 67-75
(AD-A007476; FTD-MT-24-0574-75) Avail: NTIS CSCL 20/11

The bending moments and stress-strain diagrams of circular cylindrical shells were calculated under conditions of transient creep in axisymmetric loading. Other topics discussed include flow equations, nonlinear theory of flat shells, stress concentration, Poisson ratio, integral equations, differential equations, and boundary value problems. M.J.S.

N75-24043# Naval Ship Research and Development Center, Bethesda, Md.
CGR: AN IMPROVED COMPUTERIZED MODEL TO PREDICT FATIGUE CRACK GROWTH UNDER SPECTRUM LOADING
William S. Johnson Jan. 1975 42 p refs
(SF43422)
(AD-A007481; NSRDC-4577) Avail: NTIS CSCL 20/11

A crack growth model which can be used to produce reasonably accurate predictions of crack growth under spectrum loading is presented. This model is contained in a computer program called CGR. The model was formulated through an evaluation and synthesis of the latest technology available for predicting crack propagation. An improved mathematical formulation was developed to solve the governing crack growth equations. Either the Paris or Forman equations are used to predict crack growth rates. A new method of integrating the crack growth equations over a block of constant load applications is used. Good, but limited, correlation between model predictions and experimental data has been obtained for both part-through and through-the-thickness cracks under spectrum loadings. GRA

N75-24044# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRESS CONCENTRATION IN AN EXPANDED PLATE WITH OPENING REINFORCED BY CENTRAL BELT
V. I. Grishin 28 Jan. 1975 22 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 6, 1972 p 101-106
(AD-A007672; FTD-MT-24-0521-75) Avail: NTIS CSCL 20/11

The finite element method was used to determine stress concentration in a plate with grooves. The objective was to determine the effect of proximity of the stringer to opening/aperture on stress concentration in the expanded plate. Author

N75-24045# Stanford Univ., Calif. Dept. of Applied Mechanics.
A SURVEY OF THE DEVELOPMENT OF THERMO-VISCOELASTIC STRESS ANALYSIS
Erastus H. Lee Jan. 1975 23 p refs
(Contract N00014-67-A-0112-0081; NR Proj. 064-471)
(AD-A007561; SUDAM-75-1) Avail: NTIS CSCL 20/12

This paper surveys the development and present status of stress analysis for problems in which thermo-viscoelasticity plays an essential role. For many polymers, the sensitivity of their viscoelastic characteristics to temperature variation, their poor heat conductivity and the dissipation of mechanical work into heat during viscoelastic deformation generate such problems. Needed physical characteristics and their formulation into constitutive relations are discussed. Categories of problems which call for different approaches are described and some representative examples are presented. Limitations of present formulations and methods of analysis are discussed. GRA

N75-24046# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE CRITERION FOR OPTIMUM CHARACTER FOR THE SELECTION OF THE THICKNESSES OF PLATES WHICH ARE LOCATED UNDER THE ACTION OF BENDING LOAD
A. P. Seiranyan 24 Jan. 1975 32 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinamicheskii Inst., Uch. Zap. (USSR), v. 2, no. 3, 1971 p 59-66
(AD-A007455; FTD-MT-24-0573-75) Avail: NTIS CSCL 20/11

Criteria needed to optimize a load carrying laminate and the performance of that laminate under the action of a bending load are examined. The dependence of strain energy on the addition of material on the surface of a plate was also investigated. It was proved that the plate, which possess the minimum strain energy at a constant volume of material, is characterized by the constancy of specific potential on the surface. It was shown that the plate with the constant value of surface potential can be given to the plate of the minimum weight. Author

42 GEOSCIENCES (GENERAL)

N75-24047# Oak Ridge National Lab., Tenn.
IMPORTANCE OF VALIDATION IN ECOSYSTEM ANALYSIS
J. B. Mankin, R. V. ONeill, H. H. Shugart, and B. W. Rust 1975 30 p refs Presented at the Conf. on Systems Ecology, Logan, Utah, 20 Feb. 1975 Sponsored by ERDA
(Conf-750202-2) Avail: NTIS HC $3.75

The role of models in ecosystem research is discussed and concepts needed to evaluate the credibility and verisimilitude of dynamic ecosystems models are considered. NSA

N75-24048# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
DIFFERENTIAL SEA ICE DRIFT
W. D. Hibler, III, W. F. Weeks, A. Kovacs, and S. F. Ackley Mar. 1975 44 p refs
(Grants NSF AG-344; NSF AG-492; ARPA Order 1615)
(AD-A007733; CRREL-RR-329) Avail: NTIS CSCL 08/12

The development of an accurate predictive model for the motion and deformation of arctic pack ice is believed by most engineers and scientists concerned with arctic research and development to be of prime importance both for practical operational purposes and for climatological considerations. The report, divided into two parts, describes the analysis of the 1972 results. Part I examines the results with a view toward understanding of the nature of the ice velocity field and determining the minimum scale on which the pack ice may be viewed as a continuum. Part II represents the formulation of an analytic solution of a linear drift model which includes ocean, air and Coriolis forces and models the ice as a viscoelastic medium. The predicted results of this calculation (based on meteorological variables) are compared with observed differential drift measurements with good agreement and a number of conclusions regarding ice drift calculations using a linear model are drawn. GRA

N75-24049# Washington Univ., Seattle. Dept. of Oceanography.
AN EXPERIMENTAL INVESTIGATION OF THE BOUNDARY LAYER UNDER PACK ICE
Miles G. McPhee Jan. 1975 176 p refs
(Contracts N00014-67-A-0103-0021;
N00014-67-A-0103-0034; NR Proj. 307-326;
NR Proj. 307-354)
(AD-A007335; Ref-M74-14; TR-14) Avail: NTIS CSCL 08/12

Measurements of the mean and turbulent flow structure under pack ice were made during the 1972 AIDJEX Pilot Study with small mechanical current meter triplets on three separate masts at several depths throughout the entire rotational boundary layer. In this work the analog between the ice-ocean boundary layer and the surface-atmospheric boundary layer has been explored in detail with composite averages of measured Reynolds stress and mean flow compared to predictions of recent atmospheric models. GRA

N75-24050# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
SIMULATED SNOWDRIFT PATTERNS: EVALUATION OF GEOMETRIC MODELING CRITERIA FOR A THREE DIMENSIONAL STRUCTURE
Darryl J. Calkins Mar. 1975 19 p refs
(DA Proj. 4A1-62121-A-894)
(AD-A007735; CRREL-SR-219) Avail: NTIS CSCL 08/12

Simulated drifting snow patterns were examined for a single structure using fine sand and water in a hydraulic flume. Three models of the structure were constructed at different scales and the experimental data revealed that model scale had very little effect on the areal distribution patterns. Flow velocity also had very limited influence on the drift patterns, provided the channel velocity was greater than the threshold velocity of the sand particle. Lengthening the duration of the test runs made it easier to distinguish the patterns but did not change their shape. The above experimental data suggest that modeling under the concept of Reynolds number independence is satisfactory. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N75-24051 Illinois Univ., Urbana.
AN EVALUATION OF THE PARTIAL-REFLECTION TECHNIQUE AND RESULTS FROM THE WINTER 1971-1972 D REGION Ph.D. Thesis
Luiz Costa DaSilva 1974 251 p
Avail: Univ. Microfilms Order No. 75-11687

Fundamental physical and chemical processes, and measurement techniques in the D region are reviewed. Design considerations about a partial-reflection system are made, and the main characteristics of the partial-reflection system at the University of Illinois are presented. The nature of the partial reflections are discussed, particularly reflections produced by gradients in electron density and by random fluctuations in a locally homogeneous random medium. Possible reasons for disagreement between partial reflection and rocket measurements are discussed. Some suggestions are made to improve partial-reflection data reduction, including the use of only maximums of the reflections and deconvolution of the data. The results of partial-reflection measurements at Wallops Island, Virginia, during the 1971-1972 winter are presented and compared to rocket measurements.
Dissert. Abstr.

N75-24052 Institut National de la Recherche Agronomique, Paris (France). Service de Metrologie.
MULTISPECTRAL AERIAL RECONNAISSANCE OF PARASITIC ATTACKS IN FORESTS: REMOTE SENSING Final Report [RECONNAISSANCE MULTISPECTRALE PAR SURVOL D'ATTAQUES PARASITAIRES EN FORET 'REMOTE SENSING' (SURVEILLANCE FORESTIERE)]
Charles Goillot and Charles Rossetti Jul. 1974 17 p In FRENCH
(Contract DGRST-71-7-2624)
Avail: Issuing Activity

The remote sensing technique was applied to phytosanitary problems caused by the attack of cochineals on the sea pine in various regions in France. The objective was to find the spectral signature of the trees attacked by the cochineal in the Maures and Esterel Massives and to recognize this signature in the Landes Massif. Both optical and thermal multispectral band scanners were used in the reconnaissance flights. ESRO

N75-24053*# Wisconsin Univ., Madison. Inst. for Environmental Studies.
EVALUATION OF THE APPLICATION OF ERTS-1 DATA TO THE REGIONAL LAND USE PLANNING PROCESS Final Report, Jun. 1972 - Apr. 1974
James L. Clapp, Principal Investigator, Theodore Green, III, George F. Hanson (Wisconsin State Geological and Natural History Survey), Ralph W. Kiefer, and Bernard J. Niemann, Jr. 23 Apr. 1974 315 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21754)
(E75-10280; NASA-CR-142708) Avail: NTIS HC $9.25 CSCL 08B

The author has identified the following significant results. Employing simple and economical extraction methods, ERTS can provide valuable data to the planners at the state or regional level with a frequency never before possible. Interactive computer methods of working directly with ERTS digital information show much promise for providing land use information at a more specific level, since the data format production rate of ERTS justifies improved methods of analysis.

N75-24054*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB EREP SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Apr. 1975
David S. Gilmer, Principal Investigator Apr. 1975 2 p EREP
(NASA Order T-4114-B; DI-14-16-0008-802)
(E75-10281; NASA-CR-142718) Avail: NTIS HC $3.25 CSCL 06C

The author has identified the following significant results. Surface water statistics using data obtained by supporting aircraft were generated. Signature extraction and refinement preliminary to wetland and associated upland vegetation recognition were accomplished, using a selected portion of the aircraft data. Final classification mapping and analysis of surface water trends will be accomplished.

N75-24055*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1 Apr. - 30 Apr. 1975
A. George Mourad, Principal Investigator, S. Gopalapillai, M. Kuhner, and D. M. Fubara 14 May 1975 4 p EREP
(Contract NAS9-13276)
(E75-10282; NASA-CR-142719; PR-22) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. The collocation technique to filter the remaining EREP passes no. 4, no. 6, and no. 9 was completed. The correlation studies of altimetry geoid profiles with the gravity data and ocean bottom topography were also completed.

N75-24056*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Quarterly Progress Report, Feb. - Apr. 1975
David T. Chang, Principal Investigator Apr. 1975 4 p EREP
(Contract NAS9-13343)
(E75-10283; NASA-CR-142720; QPR-8) Avail: NTIS HC $3.25 CSCL 05B

There are no author-identified significant results in this report.

N75-24057*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES,SOUTHERN CALIFORNIA Monthly Progress Report, Apr. 1975
Paul M. Merifield, Principal Investigator 5 May 1975 2 p EREP
(Contract NAS2-7698)
(E75-10284; NASA-CR-142721; MPR-23) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Images of SL2 EREP Pass 2, S192 channels were generated, with six channels usable. Analysis of SL4 photographs of the Mojave Desert were continued. An overflight was made along several active faults. A number of topographic indicators of recent faulting are identifiable in Skylab photos, particularly S190B photos.

N75-24058*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, May 1975
Craig L. Wiegand, Principal Investigator May 1975 17 p refs EREP
(NASA Order T-4105-B)
(E75-10285; NASA-CR-142722; MPR-17) Avail: NTIS CSCL 02C

The author has identified the following significant results. Correlations of multispectral scanner (MSS) digital data differences between vegetated and bare soil areas with salinity levels from the eight saline areas using MSS bands seven and ten in the infrared region were significant. Correlations were derived for Cameron County, Texas. Detection of saline soils may be possible, using either film density readings or multispectral scanner data, when the lower reflectance of vegetation on highly saline soil and the higher reflectance of vegetation on lower saline soil are considered by using film on MSS contrasts between vegetation and bare soil.

N75-24059*# Corps of Engineers, Waltham, Mass.
THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Final Report
Saul Cooper, Principal Investigator, Paul Bock (Connecticut Univ.), Joseph Horowitz (Connecticut Univ.), and Dennis Foran Mar. 1975 118 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70256-AG)
(E75-10286; NASA-CR-142709) Avail: NTIS HC $5.25 CSCL 08H

The author has identified the following significant results. Real time data collection by orbiting satellite relay was found to be both reliable and feasible. ERTS imagery was assessed and it was shown that in most cases better spatial resolution and/or additional spectral bands would be required to satisfy NED's needs. A man-computer interactive system, using cathode ray tube display could solve the problem of an unwieldy mass of data for interpretation.

N75-24060*# Wyoming Univ., Laramie. Dept. of Geology.
PRELIMINARY ANALYSIS OF THE BEAVER CREEK AND NINEMILE HILL AREAS, WIND RIVER BASIN, WYOMING USING IMAGE RATIOS AND THEMATIC CLASSIFICATION
R. W. Marrs Apr. 1975 31 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E75-10287; NASA-CR-142710) Avail: NTIS CSCL 08F

There are no author-identified significant results in this report.

N75-24061*# Rockwell International Science Center, Thousand Oaks, Calif.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM SKYLAB IMAGERY Monthly Report, Apr. 1975
Monem Abdel-Gawad, Principal Investigator 15 May 1975 2 p EREP
(Contract NAS9-14440)
(E75-10288; NASA-CR-142723; SC5007.12MR) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Surface indications of recent faulting are generally observed in EREP S190B photographs. Comparison of secondary roads (asphalt and dirt) registered in EREP and U-2 photographs together with field measurements shows that dirt and asphalt roads about seven meters wide can be detected in EREP S190B photographs where sufficient contrast exists between the tone of the road surface and surrounding terrain. In low contrast cases, roads more than ten meters wide could not be detected.

N75-24062*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Mar. 1975
Richard F. Nalepka, William A. Malila, Principal Investigators, and James P. Morgenstern 21 Apr. 1975 10 p ref EREP
(Contract NAS9-13280)
(E75-10289; NASA-CR-142724; ERIM-101900-52-L) Avail: NTIS HC $3.25 CSCL 05B

There are no author-identified significant results in this report.

N75-24063* California Univ., Berkeley. Forestry Remote Sensing Lab.
A SURVEY OF EARTH RESOURCES ON APOLLO 9 PHOTOGRAPHY
Robert N. Colwell 25 Apr. 1969 83 p Original contains color illustrations
(Contract NAS9-9348)
(NASA-CR-142900) Avail: NTIS HC $4.75 CSCL 08B

The types of photography obtained on the Apollo 9 mission and on concurrent flights made by supporting aircraft are described. The need for earth resource surveys and the value of aircraft and spacecraft as the platforms from which to make such surveys are considered along with the rational for using multiband photography and the means by which such photography can be enhanced. Aerial and space photographs are presented and analyzed. The feasibility of conducting earth resource surveys by means of space photography is discussed and results are summarized. Author

N75-24064*# Michigan Univ., Ann Arbor. Radar and Optics Div.
THE APPLICATION OF AIRBORNE IMAGING RADARS (L AND X-BAND) TO EARTH RESOURCES PROBLEMS Executive Summary Report, 1 Jun. 1973 - 30 Apr. 1974
Ben Drake, Robert A. Shuchman, M. Leonard Bryan, Richard W. Larson, Charles L. Liskow, and Robert A. Rendleman May 1974 38 p
(Contract NAS10-8333)
(NASA-CR-139385-1; ERIM-104000-1-F) Avail: NTIS HC $3.75 CSCL 08H

A multiplexed synthetic aperture Side-Looking Airborne Radar (SLAR) that simultaneously images the terrain with X-band (3.2 cm) and L-band (23.0 cm) radar wavelengths was developed. The Feasibility of using multiplexed SLAR to obtain useful information for earth resources purposes. The SLAR imagery, aerial photographs, and infrared imagery are examined to determine the qualitative tone and texture of many rural land-use features imaged. The results show that: (1) Neither X- nor L-band SLAR at moderate and low depression angles can directly or indirectly detect pools of water under standing vegetation. (2) Many of the urban and rural land-use categories present in the test areas can be identified and mapped on the multiplexed SLAR imagery. (3) Water resources management can be done using multiplexed SLAR. (4) Drainage patterns can be determined on both the X- and L-band imagery. Author

N75-24065*# Michigan Univ., Ann Arbor. Radar and Optics Div.
THE APPLICATION OF AIRBORNE IMAGING RADARS (L AND X-BAND) TO EARTH RESOURCES PROBLEMS Detailed Technical Report, 1 Jun. 1973 - 30 Apr. 1974
Ben Drake, M. Leonard Bryan, Charles L. Liskow, Robert A. Shuchman, Richard W. Larson, and Robert A. Rendleman May 1974 83 p refs
(Contract NAS10-8333)
(NASA-CR-139385-2; ERIM-104000-1-F) Avail: NTIS HC $4.75 CSCL 08H

For abstract, see N75-24064.

N75-24066*# Bittinger (M. W.) and Associates, Inc., Fort Collins, Colo.
GROUND TRUTH PROCEDURES, PHOENIX SOIL MOISTURE Mission Report, 19-22 Mar. 1975
E. Bruce Jones Apr. 1975 11 p
(Contract NAS5-22312)
(NASA-CR-143795) Avail: NTIS HC $3.25 CSCL 08M

Procedures used for collection of ground truth, in connection with passive gamma and microwave remote sensing are

summarized. Soil moisture and vegetation sampling procedures are described. J.M.S.

N75-24067*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENVIRONMENTAL ASPECTS OF RUN-OFF AND SILTATION IN THE ANACOSTIA BASIN FROM HYPERALTITUDE PHOTOGRAPHS
Carl D. Ealy (Md. Univ., College Park), Robert F. Mueller, and Jerry R. Weider (Md. Univ., College Park) Nov. 1973 49 p refs
(NASA-TM-X-70888; X-644-73-352) Avail: NTIS HC $3.75 CSCL 08H

The effects of urbanization and highway construction on run-off, erosion and siltation on the Anacostia watershed was analyzed. The analysis was based on changes in land use patterns demonstrated by aerial photographs, geologic and hydrologic data. Subwatersheds were studied in terms of three hypothetical storms of different magnitudes. An approximately 10 percent increase in impervious surface can cause a 12 percent increase in peak discharge for storms of the magnitude of tropical storm Agnes, a 20 percent increase for a 10 hour storm and a 150 percent increase for a thunderstorm. The early discharge from a storm of Agnes' magnitude can be increased by 100 percent. Corresponding effects were observed in soil erosion and siltation from bare construction sites. These effects are interrelated with sewage, oil, and chemical pollution and inadequate public transportation. The net result is steady degradation of the local environment, the estuary and the bay. Author

N75-24068*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
BROADBAND SPECTRAL PHOTOGRAPHY OF THE JAMES RIVER
Walter E. Bressette Apr. 1975 25 p refs
(NASA-TM-X-72689) Avail: NTIS HC $3.25 CSCL 08H

On May 28, 1974, a photographic mission from 5.3 kilometers altitude was flown over the James River from Norfolk to Hopewell. During the mission 252 photographs were exposed over the river. The photographs are divided into four simultaneously exposed groups with each group exposed through a different broadband optical filter. The four filters isolated blue-green, green, yellow, and near-infrared radiation from the water body. The document summarizes the mission photography in relation to flight altitude, sunglint, and photographic exposure. Author

N75-24069*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
STUDY OF USGS/NASA LAND USE CLASSIFICATION SYSTEM Final Report
G. William Spann Mar. 1975 40 p refs
(Contract NAS8-30653)
(NASA-CR-120763; GIT-A-1621) Avail: NTIS HC $3.75 CSCL 08B

The results of a computer mapping project using LANDSAT data and the USGS/NASA land use classification system are summarized. During the computer mapping portion of the project, accuracies of 67 percent to 79 percent were achieved using Level II of the classification system and a 4,000 acre test site centered on Douglasville, Georgia. Analysis of response to a questionaire circulated to actual and potential LANDSAT data users reveals several important findings: (1) there is a substantial desire for additional information related to LANDSAT capabilities; (2) a majority of the respondents feel computer mapping from LANDSAT data could aid present or future projects; and (3) the costs of computer mapping are substantially less than those of other methods. Author

N75-24070*# Louisiana State Univ., Baton Rouge. Dept. of Chemical Engineering.
DEVELOPMENT OF A THREE-DIMENSIONAL TIME-DEPENDENT FLOW FIELD MODEL
R. C. Farmer, W. R. Waldrop, F. H. Pitts, and K. R. Shah Jan. 1975 95 p refs
(Contract NAS8-30380)
(NASA-CR-120762) Avail: NTIS HC $4.75 CSCL 08H

A three-dimensional, time-dependent mathematical model to represent Mobile Bay was developed. Computer programs were developed which numerically solve the appropriate conservation equations for predicting bay and estuary flow fields. The model is useful for analyzing the dispersion of sea water into fresh water and the transport of sediment, and for relating field and physical model data. Author

N75-24071# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MANGANESE IN VIRGINIA SOILS AND CORRECTION OF MANGANESE DEFICIENCY IN SOYBEANS (GLYCINE MAX L.) Ph.D. Thesis
Marcus M. Alley Mar. 1975 119 p refs
Avail: NTIS HC $5.25

Manganese concentration in Virginia soils was studied. Soil profile samples were analyzed from catenas representing the Appalachian, Piedmont, and Coastal Plain regions. It was found that Mn concentration is higher in the Appalachian soils. Various methods of Mn application to correct Mn deficiency in soybeans were investigated in greenhouse and field research. Results are presented. Author

N75-24072*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF REMOTE SENSING TO WATERSHED MANAGEMENT
Albert Rango Apr. 1975 20 p refs Presented for presentation at Symp. on Watershed Management, Am. Soc. of Civil Engr., Logan, Utah, 11-13 Aug. 1975 Submitted for publication
(NASA-TM-X-70896; X-913-75-86) Avail: NTIS HC $3.25 CSCL 08H

Aircraft and satellite remote sensing systems which are capable of contributing to watershed management are described and include: the multispectral scanner subsystem on LANDSAT and the basic multispectral camera array flown on high altitude aircraft such as the U-2. Various aspects of watershed management investigated by remote sensing systems are discussed. Major areas included are: snow mapping, surface water inventories, flood management, hydrologic land use monitoring, and watershed modeling. It is indicated that technological advances in remote sensing of hydrological data must be coupled with an expansion of awareness and training in remote sensing techniques of the watershed management community. Author

N75-24073# North Carolina State Dept. of Administration, Raleigh. Office of State Planning.
A MAN-MACHINE PROCEDURE FOR EXTRACTING INFORMATION FROM DATA COLLECTED BY THE EARTH RESOURCES TECHNOLOGY SATELLITE Final Report
David R. Holloman Jun. 1974 125 p refs
(Grant HUD-CPA-NC-1034)
(PB-238431/1) Avail: NTIS HC $5.25 CSCL 08F

A man-machine process is reported for obtaining land use and other earth resource information from the ERTS and other multispectral scanner remote sensors and aggregating this information to 40-acre grid cells for automatic inclusion into the PLUM information system. The basis for this system was developed at the Office for Remote Sensing of Earth Resources at Pennsylvania State University. The report also discusses classification accuracy, problem areas, and costs. GRA

N75-24074# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
LOW-TEMPERATURE EVOLUTION OF HYDROCARBON GASES FROM COAL M.S. Thesis
Ann G. Kim Nov. 1974 28 p refs
(PB-238322/2; BM-RI-7965) Avail: NTIS HC $3.75 CSCL 08D

Hydrocarbon gases, are by-products of coal formation. An experiment was performed to determine if observable changes in the gases from coal could be produced at temperatures below 200C in relatively short periods of time. The experiment involved heating coal samples from six coalbeds at constant temperatures and analyzing evolved gases. The composition of the gases at three temperatures was compared. At 35C, over 99 percent of the gas is methane; at 125 and 150, methane constitutes approximately half of the hydrocarbon gas. Iso-butane and pentane are the predominant higher hydrocarbon at temperatures between 100 and 150C. GRA

N75-24075# Canada Centre for Remote Sensing, Ottawa (Ontario).
TOWARDS A CANADIAN POLICY ON REMOTE SENSING FROM SPACE, A SPECIAL REPORT TO THE CANADIAN ADVISORY COMMITTEE ON REMOTE SENSING
31 May 1974 18 p
(PB-238846/0) Avail: NTIS HC $3.25 CSCL 08G

Discussed are the development of a remote sensing program; Canadian government, industry and university capability; and basic program alternatives. GRA

N75-24076# Canadian Advisory Committee on Remote Sensing, Ottawa (Ontario).
THE CANADIAN ADVISORY COMMITTEE ON REMOTE SENSING, 1973 REPORT
1973 185 p refs
(PB-238848/6) Avail: NTIS HC $7.00 CSCL 08G

The Canadian Advisory Committee on Remote Sensing (CACRS) was established in January 1972 to effect the development of a national program of remote sensing. Covered are reports of working groups and recommendations of CACRS. GRA

N75-24077# Canada Centre for Remote Sensing, Ottawa (Ontario).
A METHOD FOR THE ESTIMATION OF THE PARAMETERS OF A GAMMA DISTRIBUTION
I. K. Crain Oct. 1973 6 p refs
(PB-238844/5; TN-73-5; Ref-73-12) Avail: NTIS HC $3.25 CSCL 08G

The gamma distribution is a useful stochastic model for linear geographic features such as geological lineaments on air-photos or remotely sensed images. A method for estimating the parameters of this distribution is given using the well known and desirable method of maximum likelihood. The simultaneous solution of the two nonlinear likelihood equations is aided by the fact that one is separable so that the system can be reduced to a single non-linear equation. The solution requires the use of a series approximation for the logarithmic derivative of the gamma function, and a computer iterative procedure to determine the parameters. GRA

N75-24078# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
INVESTIGATION OF MULTISPECTRAL TECHNIQUES FOR REMOTELY IDENTIFYING TERRAIN FEATURES AND NATURAL MATERIALS Final Report, Apr. 1969 - May 1974
P. G. Hasell, Jr., T. W. Wagner, F. J. Thomson, and R. D. Dillman May 1974 50 p refs
(Contract DOT-FH-11-7136)
(PB-238675/3; ERIM-196200-12-F; FHWA-RD-74-28) Avail: NTIS HC $3.75 CSCL 08G

Multispectral techniques for remotely identifying terrain features and natural materials are reported. During a five-year period, multispectral data were collected at sites in four states (Pennsylvania, Kansas, Virginia, and California) and various techniques were used to machine process the data. Techniques ranged from simple amplitude gating of a single spectral band to maximum likelihood classification using ten spectral bands. All techniques provided some assistance to an interpreter, some extended specific ground observations to larger areas with acceptable accuracy, and several showed promise of remote identification of materials as an operational technique in highway site planning. GRA

N75-24079# Connecticut Univ., Storrs. Inst. of Water Resources.
USE OF INTERACTIVE COMPUTER GRAPHICS IN WATER RESOURCES PLANNING AND MANAGEMENT Completion Report
Y. T. Chien Dec. 1974 18 p refs
(Contract DI-14-31-0001-3507)
(PB-238631/6; W75-03301; OWRT-A-042-CONN(5)) Avail: NTIS HC $3.25 CSCL 08H

An experimental graphics system was developed to evaluate its usefulness in the area of water resources planning and management. The system included a conceptual model and a large number of computational techniques, operational programs, and utility routines. A class of display-oriented transformational algorithms were studied in relation to the NASA ERTS imagery. By combining several spectral bands of informaton, the possiblity of delineating various classes of hydrological events (water, land, etc.) in a man-machine environment was examined. The results of a limited experimentation with a section of the Cape Cod Canal and its adjacent land are included. GRA

N75-24080# Clemson Univ., S.C. Water Resources Research Inst.
DETERMINING LAND USE CHANGES IN WATERSHEDS BY AERIAL PHOTOGRAPHIC MEASUREMENTS Partial Completion Report
M. Eugene Nettles and Donald B. Stafford Jun. 1974 63 p refs
(Contract DI-14-01-0001-4041)
(PB-239192/8; WRRI-47W75-04051; OWRT-A-024-SC(4)) Avail: NTIS HC $4.25 CSCL 13B

Techniques are described for using aerial photographs to investigate land use changes in watersheds. Land use changes in two watersheds in western South Carolina were examined. The North Tyger River watershed near Spartanburg, SC has experienced significant changes in agricultural land use over the past 26 years. The Reedy River watershed, within which most of the city of Greenville, SC, is located, has experienced rapid urbaniastion over the past 27 years. Aerial photographs taken at approximately five-year intervals were used to delineate, classify, code, and measure the areas of various land use classes in the watersheds. The land use classes employed were those that had different runoff characteristics. GRA

N75-24081# Mississippi-Alabama Sea Grant Consortium, Ocean Springs, Miss.
PROCEEDINGS FROM THE GULF STATES CONFERENCE ON COASTAL ZONE MANAGEMENT
19 Sep. 1974 178 p Conf. held at Biloxi, Miss., 18-19 Sep. 1974 Prepared in cooperation with Miss. Marine Resources Council, Jackson
(COM-75-10201/2; MASGP-74-043; NOAA-75012109) Avail: NTIS HC $7.00 CSCL 13B

Interstate problems which require emphasis to facilitate coherency in regional coastal zone management are considered. Panel discussions dealing with the following topics are presented: boundaries of the coastal zone, designating and inventorying areas of particular concern in coastal zone management; politics and regional coastal zone management; permissible land and water uses and priority of uses in the coastal zone; the organizational structure proposed to implement the management program; and public participation in coastal zone management. GRA

N75-24082# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
A DIGITAL COMPUTER SIMULATION OF THE ANNUAL SNOW AND SOIL THERMAL REGIMES AT BARROW, ALASKA
S. I. Outcalt, C. Goodwin, G. Weller, and J. Brown Mar. 1975 25 p refs
(Grant NSF 29342)
(AD-A007734; CRREL-RR-331) Avail: NTIS CSCL 08/12

An annual snow-soil simulator for Arctic tundra was developed using coupled models of surface equilibrium temperature and substrate thermal diffusion. Snow ripening, melt and accumulation are modeled in the simulator which is forced with daily weather data. The simulator predicts that a snow fence array capable of producing drift deeper than 4.2 meters will initiate a permanent snowfield at Barrow, AK. Such a man-induced snowfield could serve as a reliable source of fresh water for Barrow and similar villages in the North Slope region of Alaska. Further analysis indicated that albedo reduction due to dust fall, snow removal, etc., is dominant over aerodynamic effects in producing the early spring meltout observed at Barrow Village. GRA

N75-24083# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
MID-INFRARED SPECTRAL BEHAVIOR OF IGNEOUS ROCKS Environmental Research Papers
Graham R. Hunt and John W. Salisbury 23 Dec. 1974 141 p refs

(ILIR Proj. 4A-01)
(AD-A007680; AFCRL-TR-74-0625; AFCRL-ERP-496) Avail: NTIS CSCL 08/7

Midinfrared (6 to 40 micrometers) spectra of igneous rocks and rock-forming minerals are presented. Molecular vibration bands are identified, and the extent of spectral scatter among different samples of the same rock type is illustrated. Conclusions are drawn concerning the extent to which midinfrared spectral behavior of igneous rocks is diagnostic of composition. GRA

N75-24084# California Univ., Los Angeles. Dept. of Geography.
FIELD STUDIES AND REMOTE SENSING ALONG THE NATAL COAST, SOUTH AFRICA Final Report, 1 Apr. 1971 - 30 Jun. 1974
Antony R. Orme Aug. 1974 24 p refs
(Contract N00014-69-A-0200-4035; NR Proj. 388-102)
(AD-A007285) Avail: NTIS CSCL 08/6

The research investigated coastal terrain and related processes along the humid subtropical coast of Natal, South Africa, by combining field sampling with remote sensing data. The objectives and methods of the research are described. Seven professional papers were presented in connection with the contract. The five Technical Reports published under the contract are summarized. GRA

N75-24085# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
RED AND NEAR-INFRARED SPECTRAL REFLECTANCE OF SNOW
Harold W. OBrien and Richard H. Munis Mar. 1975 22 p refs Sponsored in part by NOAA, Washington, D. C.
(DA Proj. 1T1-61102-B-52A)
(AD-A007732; CRREL-RR-332) Avail: NTIS CSCL 08/12

The spectral reflectance of snow in the range of 0.60 to 2.50 micrometers wavelengths was studied in a cold laboratory using natural snow and simulated preparations of snow. A white barium sulfate powder was used as the standard for comparison. The high reflectance (usually nearly 100%) of fresh natural snow in the visible wavelength declines rapidly at wavelengths near and beyond 0.80 micrometers, as the spectral absorption coefficients of ice increase. The rate of decline of near-infrared reflectance due to aging is strongly affected by the history of the snow during aging. Snow aged under certain conditions may retain 90% or so of its reflectance in the visible red, yet may be only about 10% as reflective as the original fresh snow beyond 2.2 micrometers. Several environmental factors such as ambient temperature and wind effects which contribute to the variability in snow reflectance are discussed. GRA

N75-24086# Indian National Scientific Documentation Centre, New Delhi.
TEMPERATURE FIELD AND HEAT FLOW IN SNOW COVER
M. A. Dolov and M. Ch. Zalikhanov 1974 18 p refs Transl. into ENGLISH from Nauchno-Issled. Gidrometeorol. Inst. (Kiev), no. 22, 1966 p 178-186 Sponsored in part by NSF
(TT-71-51011) Avail: NTIS CSCL 08L

The daily variation of temperature and intensity of melting of snow in spring is given. Equation of heat conductivity is solved taking into account the solar radiation which has penetrated into the snow. GRA

N75-24087# Earth Satellite Corp., Washington, D.C.
REMOTE SENSING APPLICATIONS TO RESOURCE MANAGEMENT PROBLEMS IN THE SAHEL
J. B. Bale, D. Conte, D. Geohring, and D. S. Simonett Jul. 1974 264 p refs
(Contract AID-afr/c-1058)
(PB-239867/5) Avail: NTIS HC $8.50 CSCL 02D

An economic and managerial setting is given for the use of remote sensing for resource management in the Sahelian environment. Remote sensing systems and alternative costs are described. Remote sensing applications to specific resource management problems are presented. GRA

N75-24088# Geological Survey, Reston, Va. Office of International Geology.
SECOND EROS/AID INTERNATIONAL COURSE ON REMOTE SENSING
Donald G. Orr Nov. 1974 17 p
(Contract PASA-TA(IC)-02-72)
(PB-239479/9; IR-NC-42) Avail: NTIS HC $3.25 CSCL 05I

The course was designed to train participants in practical application of Earth Resources Technology Satellite (ERTS) data and aerial remote sensor systems data to resources and land use analysis and management. ERTS-1 data and aerial data from systems that might be really available to participants were emphasized. The course was attended by 34 scientists whose fields included geology, hydrology, agriculture, forestry, cartography, geography, and aerospace technology. Twenty one nations of Africa, Asia, Europe and South America were represented. This report identifies attendees and training staff, describes the activities of the course, reviews critiques of the participants, and presents a critique by the staff that deals with their own preparations and presentations. GRA

N75-24089# National Academy of Sciences - National Research Council, Washington, D.C. Advisory Committee on Technology Innovation.
MORE WATER FOR ARID LANDS, PROMISING TECHNOLOGIES AND RESEARCH OPPORTUNITIES
1974 161 p refs
(Contract AID/CSD-2584)
(PB-239472/4) Avail: NTIS HC $6.25 CSCL 13B

Technologies for the use and conservation of scarce water supplies in arid areas are described. Opportunities for development projects are indicated. The following factors are considered: methods, advantages, limitations, stage of development, and needed research and development. GRA

N75-24090# Meta System, Inc., Cambridge, Mass.
AN OPERATIONAL FRAMEWORK FOR COASTAL ZONE MANAGEMENT PLANNING
Jan. 1975 284 p refs
(Contract DI-14-31-0001-4211)
(PB-239519/2; W75-04558; OWRT-C-5208(4211)(1)) Avail: NTIS HC $8.75 CSCL 13B

Three sets of formal models were constructed to aid planning. The first set of models checks for consistency between the overall demands placed upon the coastal zone and the environmental carrying capacity of the zone. The second set of models deals with identifying the appropriate goals to be used at the various levels in the planning hierarchy. The third set of models develops a multilevel planning algorithm to provide for efficient transfer of information between the levels of government involved in the coastal zone management process. The models were tested on the coastal zone of the state of Connecticut. GRA

N75-24091# Ohio Dept. of Highways, Columbus.
INVESTIGATION OF THE ANALYTICAL STEREOPLOTTER AP/C (OP/C PHASE) IN APPLICATION TO HIGHWAY ENGINEERING PROJECTS Final Report
L. O. Hard, T. N. OBrien, C. Clipp, and K. Jeyapalan Oct. 1974 47 p refs
(PB-238461/8; OHIO-DOT-14-74) Avail: NTIS HC $3.75 CSCL 13B

The objective of the report is to study the feasibility of orthophoto mapping, in highway engineering using the AP/C - OP/C. It was found that the most valuable use of orthophoto mapping in highway engineering is as base maps on which overlays of land use maps, line maps, and geological survey maps can be made. The disadvantages are the existence of height distortion within the slit width and the consumption of AP/C time which could be used more profitably for aerial triangulation. GRA

N75-24092# Kentucky Water Resources Inst., Lexington.
HYDRAULIC AND FLOW STUDIES RELATED TO SEDIMENT TRANSPORT, KENTUCKY RIVER, KENTUCKY Research Report, Jul. 1973 - Jun. 1974
Bruce R. Moore, Michael R. Short, and Thomas Wachs Dec. 1974 64 p refs
(Contract DI-14-31-0001-4017)
(PB-239259/5; RR-81; W75-04147; OWRT-A-054-KY(1))

Avail: NTIS HC $4.25 CSCL 08H

Data relating the conditions of flow and channel shape to distribution of sediment types in the Kentucky River are presented. Seven distinct types of sediment association were delineated and these have a regular pattern of distribution influenced by the presence of navigation locks and dams. The most suitable locations for commercial extraction of bed material were clearly indicated and the variations of sand size delineated. The irregular discharge pattern of the stream indicates potential problems in the disposal of solid waste pollutants. A remeasurement of the dredge hole in the Ohio River indicated a continuation of the same vortex scour action and sand deposition analysed in earlier work. GRA

N75-24093# Clemson Univ., S.C. Water Resources Research Inst.

CORRELATION OF HYDROLOGIC MODEL PARAMETERS WITH CHANGING LAND USE AS DETERMINED FROM AERIAL PHOTOGRAPHS Final Completion Report, Jul. 1971 - Jun. 1974

James T. Ligon and Donald B. Stafford Dec. 1974 84 p refs (Contracts DI-14-31-0001-3541; DI-14-31-0001-3841) (PB-239407/0; OWRT-A-024-SC(5)) Avail: NTIS HC $4.75 CSCL 08H

The effects of progressive land use changes in watersheds on the hydrologic response of the watersheds were investigated. Watersheds were examined which have experienced significant changes in agricultural land use practices and in which rural land is being converted rapidly to urban land use. The distribution of land use in each watershed was determined at six intervals over the past 30 years from measurements on aerial photographs. A computer program was used to simulate streamflow in the watershed. The optimized model parameters and the watershed land use were correlated to examine the relationship between watershed hydrologic response and land use changes. Results are presented. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-24094*+ National Aeronautics and Space Administration, Washington, D.C.

ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, FEBRUARY 1975

Feb. 1975 260 p

(NASA-SP-7043(03)) Avail: NTIS HC $4.00 CSCL 10A

Reports, articles, and other documents introduced into the NASA scientific and technical information system from July 1, 1974 through September 30, 1974 are cited. Regional, national, and international energy systems; research and development on fuels and other sources of energy; energy conversion, transport, transmission, distribution, and storage, with emphasis on the use of hydrogen and solar energy are included along with methods of locating or using new energy resources. Emphasis is placed on energy for heating, lighting, and powering aircraft, surface vehicles, or other machinery. Author

N75-24095 Pennsylvania State Univ., University Park.

TRANSIENT OPERATION OF A STEADY STATE BURNER Ph.D. Thesis

Larry Charles Duke 1974 129 p

Avail: Univ. Microfilms Order No. 75-9772

Pollution emission levels of continuous combustion system in transient operation were compared with known low steady state values. Results have shown that transient increases of the fuel flow or decreases of the air flow cause large excursions of the pollutant concentrations from the steady state values. Approximately tenfold increases of unburned hydrocarbons and carbon monoxide accompanied by a decrease in the nitric oxide yields were representative of the transients compared to steady state. In contrast, transient fuel flow decreases or transient air flow increases demonstrated little or no deviation from the steady state operation. The parameters deemed responsible for transient behavior were the presence of fuel droplets in the reactant charge and the air fuel ratio. This conclusion was based on steady state flame stability, indicating that two distinct fuel reaction zones existed in the burner, and the predicted results of an analytical model that described the system. Author

N75-24096 Connecticut Univ., Storrs.

ELECTRIC POWER GENERATION UTILIZING A HEAT PIPE TURBINE-GENERATOR Ph.D. Thesis

Urho Sulonantti Haapala 1975 168 p

Avail: Univ. Microfilms Order No. 75-10625

The generation of electrical power utilizing a turbine-generator unit situated within the adiabatic section of a heat pipe is investigated. The analytical model is established to ascertain the interacting constraints upon the electrical power output due to fluid physical properties, total axial thermal energy transport, gravitational effects, and geometrical parameters of the heat pipe and turbine-generator unit. The analysis for the wickless heat pipe includes the effects of the rate of change of momentum, frictional losses at the liquid-vapor interface, viscous drag of the liquid at the pipe wall, variations of the rate of mass transport across the liquid-vapor interface with liquid film thickness, and the axial pressure gradients of the vapor. It is shown that optimum power output occurs at the maximization of the product of the mass flux and the available pressure gradient across the adiabatic section. The design analysis of a terrestrial power generation station utilizing solar energy or the oceanic-atmospheric temperature gradient occurring in the arctic or antarctic regions is presented. Dissert. Abstr.

N75-24097*# Sperry Rand Corp., New York.

EXPERIMENTAL INVESTIGATION AND MODEL DEVELOPMENT OF THE SKYLAB ATM SECONDARY NICKEL-CADMIUM BATTERIES

W. W. Kirsch 10 May 1974 69 p refs

(Contract NAS8-21812)

(NASA-CR-120749) Avail: NTIS HC $4.25 CSCL 10B

The performance of a Ni-Cd battery was evaluated and the cyclic battery controls to be used on the ATM batteries were determined. Cell and battery performance models were developed which to predict the performance of the secondary Ni-Cd batteries on the ATM. Capacity degradation and charge acceptance characteristics were considered. Mathematical models for each of these operating areas were developed based on data from two separate test programs. The capacity degradation model describes the expected usable battery capacity as a function of time, temperature, and depth-of-discharge. The charge acceptance model describes the cell charge acceptance as a function of charge rate, temperature, and state of charge. The models were designed for computer use and to facilitate possible battery modification. They can be used to predict expected performance or to compare real time performance during flight. Author

N75-24098# Spectrolab, Inc., Sylmar, Calif.

PHOTOVOLTAIC SOLAR POWER SYSTEMS

E. L. Ralph 23 Mar. 1974 27 p Presented at the Solar Energy Lecture 2, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.

Avail: NTIS HC $3.75

An introduction into photovoltaic device theory and design is given to provide a background for discussing applications for solar power system. The potential for using silicon solar cells to provide large amounts of electrical power is shown and a proposed plan for developing solar power systems for a wide range of applications is described. Solar power systems utilized in remote locations where conventional power lines are not available are described along with the satellite solar power station which is designed to generate 5,000 megawatts of power. Author

N75-24099*# Little (Arthur D.), Inc., Cambridge, Mass.
SPACE SATELLITE POWER SYSTEM
Peter E. Glaser 28 Mar. 1974 24 p Presented at the Solar Energy Lecture 3, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng. Sponsored by NASA
(NASA-CR-142799) Avail: NTIS HC $3.25 CSCL 10A

The concept of a satellite solar power station was studied. It is shown that it offers the potential to meet a significant portion of future energy needs, is pollution free, and is sparing of irreplaceable earth resources. Solar energy is converted by photovoltaic solar cell arrays to dc energy which in turn is converted into microwave energy in a large active phased array. The microwave energy is beamed to earth with little attenuation and is converted back to dc energy on the earth. Economic factors are considered. Author

N75-24100# Arizona Univ., Tucson. Optical Sciences Center.
SOLAR PHOTOTHERMAL POWER CONVERSION
Aden B. Meinel and Marjorie P. Meinel 11 Apr. 1974 28 p Presented at the Solar Energy Lecture 5, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Avail: NTIS HC $3.75

The photothermal conversion of sunlight into heat and then into electric power is examined. The application of solar energy for heating and cooling domestic and commercial buildings is discussed in terms of efficiency, convenience, and economics. The concept of solar energy farms for the production of electrical power on a large scale is considered to be cost effective. J.M.S.

N75-24101# Massachusetts Univ., Amherst. Dept. of Civil Engineering.
OCEANIC AND ATMOSPHERIC ENERGY SOURCES
William E. Heronemus 18 Apr. 1974 59 p Presented at the Solar Energy Lecture 6, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Avail: NTIS HC $4.25

Solar energy processes are discussed in terms of decreasing consumption of fossil fuels and utilization of renewable energy sources. Emphasis is placed on the windpower process and the ocean thermal differences process which are based on natural collection of solar energy. J.M.S.

N75-24102# Maryland Univ., College Park. Dept. of Mechanical Engineering.
THE NATIONAL SOLAR ENERGY PROGRAM
Frederick H. Morse 25 Apr. 1974 42 p Presented at the Solar Energy Lecture 7, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Copyright. Avail: NTIS HC $3.75

The major efforts within the National Solar Energy Program are described. The following areas are included: heating and cooling of buildings, solar thermal energy conversion, photovoltaics, bioconversion, wind energy conversion, and ocean thermal energy conversion. J.M.S.

N75-24103# InterTechnology Corp., Warrenton, Va.
THE ENERGY PLANTATION
Clinton C. Kemp 2 May 1974 24 p Presented at the Solar Energy Lecture 8, Washington, D. C., Mar.-May 1974; sponsored by IEEE, Washington Acad. of Sci., and Washington Soc. of Eng.
Avail: NTIS HC $3.25

Conversion of solar energy accomplished by using photosynthesis to grow plant materials for their fuel value is discussed. It is shown that an energy plantation is self renewing and is cost competitive with coal or oil at equal environmental impact. Author

N75-24104# Joint Committe on Atomic Energy (U. S. Congress).
SOLAR ENERGY RESEARCH AND DEVELOPMENT
Washington GPO 1975 851 p refs Hearings on S. 2819 and S. 3234 before Joint Comm. on Atomic Energy, 93d Congr., 2d Sess., 7-8 May 1974
(GPO-40-684) Avail: SOD HC $6.70

Testimony is provided on the present status and future prospects for solar energy utilization and technology. Emphasis is placed on focusing the scattered energy programs in a single agency, the Energy Research and Development Administration. The following major areas of solar energy research are considered: solar heating and cooling of buildings; solar thermal conversion systems; wind electric power; bioconversion to fuels; ocean thermal electric power; and photovoltaic electric power. J.M.S.

N75-24105*# Barber-Colman Co., Irvine, Calif. Resources Recovery Systems.
PRODUCTION OF GASEOUS FUEL BY PYROLYSIS OF MUNICIPAL SOLID WASTE Final Report
T. H. Crane, H. N. Ringer, and D. W. Bridges 20 Mar. 1975 65 p
(Contract NAS9-14305)
(NASA-CR-141791) Avail: NTIS HC $4.25 CSCL 10A

Pilot plant tests were conducted on a simulated solid waste which was a mixture of shredded newspaper, wood waste, polyethylene plastics, crushed glass, steel turnings, and water. Tests were conducted at 1400 F in a lead-bath pyrolyser. Cold feed was deaerated by compression and was dropped onto a moving hearth of molten lead before being transported to a sealed storage container. About 80 percent of the feed's organic content was converted to gaseous products which contain over 90 percent of the potential waste energy; 12 percent was converted to water; and 8 percent remained as partially pyrolyzed char and tars. Nearly half of the carbon in the feed is converted to benzene, toluene and medium-quality fuel gas, a potential credit of over $25 per ton of solid waste. The system was shown to require minimal preprocessing and less sorting then other methods. Author

N75-24106*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC DESIGN OF A FREE POWER TURBINE FOR A 75 KW GAS TURBINE AUTOMOTIVE ENGINE
Milton G. Kofskey, Theodore Katsanis, and Lawrence F. Schumann (Army Air Mobility Res. and Develop. Lab.) Apr. 1975 62 p refs
(NASA-TM-X-71714; E-8335) Avail: NTIS HC $4.25 CSCL 21E

A single stage axial-flow turbine having a tip diameter of 15.41 centimeters was designed. The design specifications are given and the aerodynamic design procedure is described. The design includes the transition duct and the turbine exit diffuser. The aerodynamic information includes typical results of a parametric study, velocity diagrams, blade surface and wall velocities, and blade profile and wall coordinates. Author

N75-24107*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE DEVELOPMENT OF A SOLAR RESIDENTIAL HEATING AND COOLING SYSTEM
4 Apr. 1975 53 p
(NASA-CR-142728; M-TU-75-3) Avail: NTIS HC $4.25 CSCL 10A

The MSFC solar heating and cooling facility was assembled to demonstrate the engineering feasibility of utilizing solar energy for heating and cooling buildings, to provide an engineering evaluation of the total system and the key subsystems, and to investigate areas of possible improvement in design and efficiency. The basic solar heating and cooling system utilizes a flat plate solar energy collector, a large water tank for thermal energy storage, heat exchangers for space heating, and an absorption cycle air conditioner for space cooling. A complete description of all systems is given. Development activities for this test system included assembly, checkout, operation, modification, and data analysis, all of which are discussed. Selected data analyses for the first 15 weeks of testing are included, findings associated with energy storage and the energy storage system are outlined, and conclusions resulting from test findings are provided. An evaluation of the data for summer operation indicates that the current system is capable of supplying an average of 50 percent of the thermal energy required to drive the air conditioner. Preliminary evaluation of data collected for operation in the heating mode during the winter indicates that

nearly 100 percent of the thermal energy required for heating can be supplied by the system. Author

N75-24108*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE HIGH INTENSITY SOLAR CELL: KEY TO LOW COST PHOTOVOLTAIC POWER
Bernard L. Sater and Chandra Goradia (Cleveland State Univ.) 1975 12 p refs Presented at the 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975
(NASA-TM-X-71718; E-8338) Avail: NTIS HC $3.25 CSCL 10A

The design considerations and performance characteristics of the 'high intensity' (HI) solar cell are presented. A high intensity solar system was analyzed to determine its cost effectiveness and to assess the benefits of further improving HI cell efficiency. It is shown that residential sized systems can be produced at less than $1000/kW peak electric power. Due to their superior high intensity performance characteristics compared to the conventional and VMJ cells, HI cells and light concentrators may be the key to low cost photovoltaic power. Author

N75-24109*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF SUNSHINE TESTING ON TERRESTRIAL SOLAR CELL SYSTEM COMPONENTS
Americo F. Forestieri and Evelyn Anagnostou 1975 8 p refs Presented at the 11th photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71722) Avail: NTIS HC $3.25 CSCL 10A

Samples of FEP encapsulated silicon solar cells and various potential encapsulation or cover materials were subjected to accelerated and real time testing. By measuring changes in solar cell output or optical transmission as a function of exposure the durability of the samples was evaluated. Results are presented. Author

N75-24110*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COST COMPETITIVENESS OF A SOLAR CELL ARRAY POWER SOURCE FOR ATS-6 EDUCATIONAL TV TERMINAL
R. M. Masters Apr. 1975 9 p refs
(NASA-TM-X-71720; E-8327) Avail: NTIS HC $3.25 CSCL 10B

A cost comparison is made between a terrestrial solar cell array power system and a variety of other power sources for the ATS-6 Satellite Instructional Television Experiment (SITE) TV terminals in India. The solar array system was sized for a typical Indian location, Lahore. Based on present capital and fuel costs, the solar cell array power system is a close competitor to the least expensive alternate power system. A feasibility demonstration of a terrestrial solar cell array system powering an ATS-6 receiver terminal at Cleveland, Ohio is described. Author

N75-24111*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OUTDOOR FLAT-PLATE COLLECTOR PERFORMANCE PREDICTION FROM SOLAR SIMULATOR TEST DATA
Frederick F. Simon and Edgar H. Buyco 29 May 1975 17 p refs Presented at 10th Thermal Phys. Conf., Denver, 27-29 May 1975; sponsored by AIAA
(NASA-TM-X-71707; E-8320) Avail: NTIS HC $3.25 CSCL 10B

Solar collector performance data obtained from tests with a simulator was modified for real-life conditions. The data obtained with the simulator was corrected for the variable conditions of ambient temperature, wind, incident angle, flow rate, etc., that are encountered outdoors. Modification of simulator data was accomplished by combining experiment with theory. The technique was demonstrated by application to a spectrally selective and a nonselective type of collector. This kind of modified simulator collector performance data should be valuable in solar systems analysis and for collector performance ranking based on all-day calculated conditions. Author

N75-24112*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCES IN THE THEORY AND APPLICATION OF BSF CELLS
Joseph Mandelkorn and John H. Lamneck 8 May 1975 6 p refs Presented at 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71723; E-8344) Avail: NTIS HC $3.25 CSCL 10B

The characteristics and behavior of p(+), p solar cells were investigated. The p(+), p cells were made by the removal of the n(+) surface layers from n(+), p p(+), BSF cells followed by application of a suitable contact to the resultant p(+), p structures. The open circuit voltage of p(+), p cells was found to increase with increasing 'p' bulk resistivity. The measured open circuit velocity-temperature coefficients were positive and increased with increasing resistivity. An outline of prior limitations in solar cell design is presented, and the removal of these limitations through use of BSF effects is pointed out. The study of BSF effects made feasible production of very thin high efficiency silicon cells as well as high resistivity-high efficiency cells, two desirable types of silicon cells which were previously impossible to make. Author

N75-24113*# Institute of Gas Technology, Chicago, Ill.
HYDROGEN PRODUCTION FROM COAL Interim Report
24 Apr. 1975 16 p Presented at NASA Symp., Huntsville, Ala., 24 Apr. 1975
(Contract NAS1-13620)
(NASA-CR-142816) Avail: NTIS HC $3.25 CSCL 10A

The gasification reactions necessary for the production of hydrogen from montana subbituminous coal are presented. The coal composition is given. The gasifier types mentioned include: suspension (entrained) combustion; fluidized bed; and moving bed. Each gasification process is described. The steam-iron process, raw and product gas compositions, gasifier feed quantities, and process efficiency evaluations are also included. L.B.

N75-24114# Joint Economic Committee (U. S. Congress).
ENERGY IMPORTS AND THE US BALANCE OF PAYMENTS
Washington GPO 1974 166 p refs Hearings before Subcomm., on Intern. Economics of Joint Economic Comm. 93d Congr., 1st Sess., 6-8 Nov. 1973
(GPO-28-965) Avail: Subcomm. on Intern. Economics

Testimony is provided on the U.S. balance of payments in terms of availability of imported oil and high prices. Import policy is reassessed in order to reduce reliance on foreign sources and minimize overall energy cost. An analytical model developed and designed to evaluate basic assumptions with respect to oil prices and oil import levels is presented. J.M.S.

N75-24115# Committee on Banking and Currency (U. S. House).
THE ECONOMICS OF ENERGY AND NATURAL RESOURCE PRICING
Washington GPO Mar. 1975 797 p refs Compilation of Reports and Hearings of the Ad Hoc Comm. on the Domestic and International Monetary Effect of Energy and other Natural Resource Pricing of Comm. on Banking, Currency, and Housing, 94th Congr., 1st Sess., Mar. 1975
(GPO-48-071) Avail: Comm. on Banking and Currency

The economic impact of the drastic increase in energy prices is assessed along with the problems which may occur with similar price increases in other natural resources. The historical development of the international petroleum market was surveyed, and the problems of adjusting to the petroleum shortages of 1973-1974 are analyzed. The issue of energy security for the United States in the light of current and projected policies of the Organization of Petroleum Exporting Countries were examined. This includes a series of recommendations to enhance American energy security, taking cognizance of the various costs attached to alternative policies. The effects were investigated of the long run upward trend in energy prices on the domestic economy with particular reference to structural shifts in production consumption, and the distribution of income. International monetary problems and the particular difficulties facing less-developed countries are discussed along with the balance-of-

payments problems confronting the United States and its major trading partners. The United States future resource needs and policies are discussed. M.J.S.

N75-24116*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPRESSOR DESIGNED FOR THE ENERGY RESEARCH AND DEVELOPMENT AGENCY AUTOMOTIVE GAS TURBINE PROGRAM
Michael R. Galvas May 1975 32 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TM-X-71719; E-8365) Avail: NTIS HC $3.75 CSCL 21E

A centrifugal compressor was designed for a gas turbine powered automobile as part of the Energy Research and Development Agency program to demonstrate emissions characteristics that meet 1978 standards with fuel economy and acceleration which are competitive with conventionally powered vehicles. A backswept impeller was designed for the compressor in order to attain the efficiency goal range required for the objectives of this program. Details of the design and method of flow analysis of the compressor are presented. Author

N75-24117*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF HIGH DOPING LEVELS SILICON SOLAR CELL PERFORMANCE
M. P. Godlewski, H. W. Brandhorst, and C. R. Baraona 1975 8 p refs Presented at 11th Photovoltaic Spec. Conf., Phoenix, 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71728; E-8351) Avail: NTIS HC $3.25 CSCL 10B

The significance of the heavy doping effects (HDE) on the open-circuit voltage of silicon solar cells is assessed. Voltage calculations based on diffusion theory are modified to include the first order features of the HDE. Comparisions of the open-circuit voltage measured for cells of various base resistivities are made with those calculated using the diffusion model with and without the HDE. Results indicate that the observed variation of voltage with base resistivity is predicted by these effects. A maximum efficiency of 19% (AMO) and a voltage of 0.7 volts are calculated for 0.1 omega-cm cells assuming an optimum diffused layer impurity profile. Author

N75-24118*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STANDARDIZED SOLAR SIMULATOR TESTS OF FLAT PLATE SOLAR COLLECTORS. 1: SOLTEX COLLECTOR WITH TWO TRANSPARENT COVERS
Frederick Simon May 1975 13 p refs
(NASA-TM-X-71738; E-8362) Avail: NTIS HC $3.25 CSCL 10B

A Soltex flat plate solar collector was tested with a solar simulator for inlet temperatures of 77 to 201 F, flux levels of 240 and 350 Btu/hr-sq ft, a collant flow rate of 10.5 lb/hr sq ft, and incident angles of 0 deg, 41.5 deg, and 65.2 deg. Collector performance is correlated in terms of inlet temperature, flux level, and incident angle. Author

N75-24119*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
V-GROOVED SILICON SOLAR CELLS
Cosmo R. Baraona and Henry W. Brandhorst [1975] 10 p refs Presented at 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71715; E-8336) Avail: NTIS HC $3.25 CSCL 10B

Silicon solar cells with macroscopic V-shaped grooves and microscopically texturized surfaces were made by preferential etching techniques. Various conditions for potassium hydroxide and hydrazine hydrate etching were investigated. Optical reflection losses from these surface were reduced. The reduced reflection occurred at all wavelengths and resulted in improved short circuit current and spectral response. Improved collection efficiency is also expected from this structure due to generation of carriers closer to the cell junction. Microscopic point measurements of collected current using a scanning electron microscope showed that current collected at the peaks of the texturized surface were only 80 percent of those collected in the valleys. Author

N75-24120*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTERDISCIPLINARY STUDY OF ATMOSPHERIC PROCESSES AND CONSTITUENTS OF THE MID-ATLANTIC COASTAL REGION Annual Report, 1 Jun. 1974 - 31 May 1975
Earl C. Kindle, Earl C. Bandy, Gary Copeland, Roger Blais, Gerald Levy, and Daniel Sonenshine May 1975 43 p refs
(Grant NGL-47-003-067)
(NASA-CR-142820) Avail: NTIS HC $3.75 CSCL 01A

Past research projects for the year 1974-1975 are listed along with future research programs in the area of air pollution control, remote sensor analysis of smoke plumes, the biosphere component, and field experiments. A detailed budget analysis is presented. Attachments are included on the following topics: mapping forest vegetation with ERTS-1 MSS data and automatic data processing techniques, and use of LARS system for the quantitative determination of smoke plume lateral diffusion coefficients from ERTS images of Virginia. M.J.S.

N75-24121*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTERDISCIPLINARY STUDY OF ATMOSPHERIC PROCESSES AND CONSTITUENTS OF THE MID-ATLANTIC COASTAL REGION. ATTACHMENT 3: DATA SET FOR CRANEY ISLAND OIL REFINERY INSTALLATION EXPERIMENT
Earl C. Kindle, Alan Bandy, Gary Copeland, Roger Blais, Gerald Levy, Daniel Sonenshine, Donald Adams, and George Maier May 1975 120 p
(Grant NGL-47-003-067)
(NASA-CR-142823) Avail: NTIS HC $5.25 CSCL 01A

Data tables and maps are presented which include background information and experimental data on the Craney Island oil refinery installation experiment. The experiment was to investigate air pollution effects. M.J.S.

N75-24122*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTERDISCIPLINARY STUDY OF ATMOSPHERIC PROCESSES AND CONSTITUENTS OF THE MID-ATLANTIC COASTAL REGION. ATTACHMENT 4: DATA SET FOR BACKGROUND INVESTIGATION OF ATMOSPHERIC CONSTITUENTS FOR NANSEMOND RIVER SITE
Earl C. Kindle, Earl C. Bandy, Gary Copeland, Roger Blais, Gerald Levy, Daniel Sonenshine, Donald Adams, and George Maier May 1975 261 p
(Grant NGL-47-003-067)
(NASA-CR-142821) Avail: NTIS HC $8.50 CSCL 01A

Background data was provided for the assessment of the environmental impact of a proposed oil refinery location. Climatic background, particulate data, digitized portrayal of site molecular and meteorological data, graphical portrayal of molecular data, hourly meteorological data, and streamflow charts and radiosonde data are given M.J.S.

N75-24123# Committee of Conference (U. S. Congress).
ENERGY REORGANIZATION ACT OF 1974
Washington GPO 9 Oct. 1974 39 p refs Conference Rept. to accompany H.R. 11510, 93d Congr., 2d Sess., 9 Oct. 1974
(S-Rept-93-1252; GPO-38-010) Avail: US Capitol, Senate Document Room

The formation of the Energy Research and Development Administration is discussed in detail, along with a Nuclear Energy Commission. Topics included are duties of the Administration, personnel, appropriations, personnel qualifications, and research activities. M.J.S.

N75-24124# Committee on Government Operations (U. S. Senate).
ENERGY REORGANIZATION ACT OF 1974
Washington GPO 1974 118 p refs Rept. to accompany S. 2744 presented by the Comm. on Government Operations at the 93d Congr., 2d Sess., 27 Jun. 1974
(S-Rept-93-980; GPO-34-980) Avail: SOD HC $1.20

A Congressional Report is presented to reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration. A new nuclear safety and licensing commission is discussed in order to promote more efficient management of such functions. M.C.F.

N75-24125# Committee on Foreign Relations (U. S. Senate).
ENERGY AND FOREIGN POLICY
Washington GPO 1974 241 p refs Hearings before Comm. on Foreign Relations, 93d Congr., 1st Sess., 30-31 May 1973
(GPO-22-562) Avail: Comm. on Foreign Relations

A general survey of the energy problem and its implications on American foreign policy are presented. In particular, the energy requirements of the United States in relation to the Persian Gulf were examined. Topics discussed include our domestic oil supply, politics in the Middle East, research and development of energy sources, international monetary reform negotiations, oil and gas distribution in the United States, demand and supply, energy consumption, domestic production, taxes, and international relations. M.J.S.

N75-24126# Oak Ridge National Lab., Tenn.
STUDY OF THE APPLICATION OF HTGR TO A PETROLEUM REFINERY PETROCHEMICAL COMPLEX
Truman D. Anderson and Irving Spiewak 1975 11 p refs Presented at the BNES Intern. Conf. on the HTGR Process Appl., London, Eng., 26/28 Nov. 1974
(Conf-741144-1) Avail: NTIS HC $3.25

The high-temperature gas-cooled reactor (HTGR) is discussed as a source of industrial energy for applications in petroleum refining and petrochemical plants. Applications are limited to joint uses of a nuclear power station due to the mismatch in size between nuclear plants and industrial plants and the need for multiple nuclear units to provide reliability. It is suggested that the electric utilities generate electricity for the grid and thermal energy for local industries, thus HTGR would have significant economic advantages over alternative fossil energy systems. Author (NSA)

N75-24127# Parsons (Ralph M.) Co., Pasadena, Calif.
DEMONSTRATION PLANT, CLEAN BOILER FUELS FROM COAL. VOLUME 3: PRELIMINARY DESIGN/ECONOMICS ANALYSIS Interim Report
J. B. OHara, S. N. Rippee, and R. V. Teeple Dec. 1974 60 p
(Contract DI-14-32-0001-1234)
(PB-238529/2; OCR-82-INT-1-Vol-3) HC $4.25 CSCL 07A

A preliminary economic analysis for a demonstration plant designed to produce clean boiler fuels from coal is summarized. Investment and operating cost estimates are provided based on mid-1973 values. Product selling prices required to provide a specified discounted cash flow return are included for various financial structures. GRA

N75-24128# Bechtel Corp., San Francisco, Calif.
PATH TO SELF-SUFFICIENCY DIRECTIONS AND CONSTRAINTS Final Report
M. Carasso, J. M. Gallagher, and K. J. Sharma Aug. 1974 168 p
(Grant NSF C-867)
(PB-239099; BECHTEL-10900-74-43-I) Avail: NTIS HC $6.25 CSCL 21D

A model of the U.S. energy supply system is described which calculates direct resources required to bring on-line the additional required energy supply facilities for specified future U.S. energy programs. A computer program is presented which calculates resource requirements and summarizes results for any fuel mix by tabulating an annual schedule of capital, manpower, and materials requirements. The model is exercised for two fuel mixes and the implications are discussed in terms of capital, manpower, and materials constraints. Author

N75-24129# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INTERDISCIPLINARY ENGINEERING APPROACH TO A FACILITY DESIGN STUDY WITH EMPHASIS ON ENERGY CONSERVATION. VOLUME 2: MAIN REPORT TEXT Facility Systems Integration Design Study
Robert J. Garlow, John F. Gilg, Charles A. Jackson, Jay N. Magill, and Robert S. Najaka Nov. 1974 275 p refs
(AD-A006804; GCE/MC/74-1-Vol-2) Avail: NTIS CSCL 15/5

A discussion of the method used in the interdisciplinary engineering approach to the study is discussed in Chapter II. Chapter III covers the design of the structural components of the facility with a detailed discussion of the loads used in the design and other factors which weighed upon the selection of the components. Chapter IV discusses the determination of loads used in the design of mechanical systems, a comparison of various heating and air conditioning systems, the design of the heating and cooling systems, and the design of an energy recovery system. Chapter V presents a detailed analysis of the A/E electrical design, along with the design of a lighting system and the coordination of circuit protection devices. Chapter VI summarizes the results of the civil, electrical and mechanical designs, and Chapter VII presents conclusions drawn from the study and recommendations for future application of the techniques used in the study. GRA

N75-24130# Versar, Inc., Springfield, Va.
INDUSTRIAL ENERGY STUDY OF THE DRUG MANUFACTURING INDUSTRIES FOR THE FEDERAL ENERGY ADMINISTRATION/US DEPARTMENT OF COMMERCE Final Report
30 Sep. 1974 209 p refs
(PB-238994/8; FEA/EI-1669) Avail: NTIS HC $7.25 CSCL 10A

Information is provided on the basic structure and characteristics of the drug manufacturing industries. Particular emphasis is placed on fuel use by major type and production process as well as exploring the possibilities for fuel substitutability and conservation alternatives. GRA

N75-24131# Bureau of Mines, Grand Forks, N.Dak. Energy Research Labs.
TECHNOLOGY AND USE OF LIGNITE Information Circular
Gordon H. Gronhovd, comp. and Wayne R. Kube, comp. Nov. 1974 272 p refs Presented at the 1973 Lignite Symp., Grand Forks, N. D., 9-10 May 1973; sponsored in part by North Dakota Univ.
(PB-238666/2; BM-IC-8650) Avail: NTIS MF $2.25; SOD HC $3.30 as C.128.27:8650 CSCL 21D

Papers concerned with the technology and utilization of low-rank fossil fuels are presented. The following topics were included: air pollution; coal gasifaction and coal liquefaction; thermal power plants; stream electric power generation; and coal handling, storage, and transportation. J.M.S.

N75-24132# Boston Univ., Mass. Dept. of Chemistry.
PHOTOCHEMICAL CONVERSION OF SOLAR ENERGY Quarterly Report, 1 Jul. - 30 Sep. 1974
Norman N. Lichtin 31 Oct. 1974 37 p refs
(Grant NSF AER-72-03579)
(PB-238533/4; NSF/RA/N-74-138;
NAS/RANN/SE/AER-72-03597/A03) Avail: NTIS HC $3.75 CSCL 07E

Photogalvanic cell chemistry research results are discussed. High conversion efficiencies were obtained using the trifluoromethane-sulfonate anion (TFMS(-)) than with chloride. Conversion efficiency of the SNO2/Pt cell illuminated perpendicular to the electrode surfaces increased with increase of solution depth up to .05mm. Using values of the Kosower solvent parameter, Z, logarithms of specific rates of disproportionation of semithionine (TH2(+)) in a wide variety of organic solvents show the same positive linear dependence on Z. The effects of a number of variables on the (second order) kinetics of oxidation of leucothionine (TH3(+)) by Fe(III) were determined. A number of coordination complexes of iron with formal reduction potentials varying over a factor of about 3 were prepared. GRA

N75-24133# Battelle Pacific Northwest Labs., Richland, Wash.
ASSESSMENT OF URANIUM AND THORIUM RESOURCES IN THE UNITED STATES AND THE EFFECT OF POLICY ALTERNATIVES Final Report
J. B. Burnham, R. E. Brown, W. I. Enderlin, M. S. Hanson, and J. N. Hartley Dec. 1974 223 p refs
(Contract NSF C-914)
(PB-238658/9) Avail: NTIS HC $7.25 CSCL 08I

Uranium and thorium resources of the United States were examined along with the state-of-the-art of uranium exploration, mining, milling, and environmental practices. The effects of alternative governmental policy options on the price and availability of uranium were investigated. GRA

N75-24134# Massachusetts Univ., Amherst. Dept. of Mechanical Engineering.
VARIATIONS IN HEAT EXCHANGER DESIGN FOR OCEAN THERMAL DIFFERENCE POWER PLANTS
J. G. McGowan, J. W. Connell, and R. Braren Feb. 1974 51 p refs
(Grant NSF GI-34979)
(PB-238572/2; NSF/RANN/SE/GI-34979/TR-74/4; NSF/RA/N-74-110) Avail: NTIS HC $4.25 CSCL 10B

Variation in heat exchanger design and configuration for a class of ocean thermal power plants is discussed. Details of the heat exchanger models are summarized and analytical results for component and cycle variations are presented. A heat exchanger optimization program is discussed in detail. GRA

N75-24135# Gordian Associates, Inc., New York.
WHERE THE BOILERS ARE: A SURVEY OF ELECTRIC UTILITY BOILERS WITH POTENTIAL CAPACITY FOR BURNING SOLID WASTE AS FUEL Final Report
Barry G. Tunnah, Adel Hakki, and Roger J. Leonard 1974 337 p refs
(Contract EPA-68-01-1132)
(PB-239392/4; EPA-SW-530-88c) Avail: NTIS HC $9.50 CSCL 10B

The use of prepared solid waste as a supplementary fuel is investigated as a method for recovering energy from commercial and residential solid wastes. Survey results intended to help local decision-makers in assessing the availability of electric utility boilers with potential for using prepared solid waste as supplementary fuel are presented. Details are given for investor-owned and municipally-owned plants on the following items: (1) boiler characteristics; (2) energy requirements for electricity generation; (3) potential energy available from combustion of solid waste derived from specified areas around each plant; (4) typical transportation distances from the centers of waste generation to the plants, and (5) the potential waste-burning capacity per day of each boiler if solid waste replaced 10 percent of its fossil fuel. GRA

N75-24136# Arizona State Univ., Tempe. Engineering Research Center.
TERRESTRIAL PHOTOVOLTAIC POWER SYSTEMS WITH SUNLIGHT CONCENTRATION Quarterly Report, 1 Jul. - 30 Sep. 1974
C. E. Backus Oct. 1974 52 p Prepared in cooperation with Textron, Inc., Sylmar, Calif.
(Grant NSF GI-41894)
(PB-238506/0; ERC-R-74017; NSF/RANN/SE/GI-41894/PR-74-3; NSF/RA/N-74-129) Avail: NTIS HC $4.25 CSCL 10B

Basic parametric relationships in a solar system that concentrates sunlight onto solar cells are investigated. These relationships are used to determine the optimum combination of components that minimize the cost per watt of these systems. Progress is reported in the following study tasks: solar cell design; solar concentrator; fh heat rejection; solar tracker; and systems analysis. GRA

N75-24137# Arizona Univ., Tucson. Optical Sciences Center.
CHEMICAL VAPOR DEPOSITION RESEARCH FOR FABRICATION OF SOLAR ENERGY CONVERTERS Quarterly Report, 1 Jul. - 30 Sep. 1974
B. O. Seraphin 28 Oct. 1974 41 p
(Grant NSF GI-36731)
(PB-238947/6; NSF/RANN/SE/GI-36731/PR/74/3; NSF/RA/N-74-128; QR-3) Avail: NTIS HC $3.75 CSCL 10B

A selective solar energy convertor that can be used to transform solar radiation into high temperature heat is discussed. The selective solar energy convertor is basically a two-layered construction in which the top layer is a semiconductor material, such as silicon, having high absorption for solar radiation and high transparency for blackbody radiation from the heated unit. The bottom layer is a metal film having high reflectance. The completion of the entire stack, including an antireflection coating of silicon nitride is described. GRA

N75-24138# National Center for Energy Management and Power, Philadelphia, Pa.
ELECTRIC POWER RIGHTS: ONE APPROACH TO RATIONING
Ann L. Strong Jul. 1973 34 p refs
(Grant NSF GI-29729)
(PB-238537/5; NSF/RANN/SE/GI-29729/TR-73-4; NSF/RA/N-73-082) Avail: NTIS HC $3.75 CSCL 10A

A description is given of the system of water rights used in certain western states. It is proposed that such a system might be employed as electricity rights in a region in which electricity supplies are insufficient to meet demand. The various problems which would arise are examined. GRA

N75-24139# Systems Control, Inc., Palo Alto, Calif.
ELECTRIC POWER SYSTEMS ANALYSIS RESEARCH
John Peschon and Leif Isaksen Jul. 1974 249 p refs
(Contract NSF C-756)
(PB-239236/3; NSF/RA/N-74-171) Avail: NTIS HC $7.50 CSCL 09C

The special systems analysis needs of large-scale interconnected electric power systems are considered. Procedures to encourage and facilitate the implementation of successful research projects, through more effective professional interactions, are investigated. Technical descriptions of eleven major functional activity areas are presented in order to provide a structured overview of the problems and associated systems analysis research needs of interconnected electric power systems. Specific research opportunities are summarized. GRA

N75-24140# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
ENERGY SYSTEM MODELING-INTERFUEL COMPETITION Progress Report
M. L. Baughman and P. L. Joskow Feb. 1974 28 p refs
(Grant NSF GI-39150)
(PB-239292/6; NSF/RA/N-74-165) Avail: NTIS HC $3.75 CSCL 21D

The Energy System Modeling program addresses issues of interfuel substitution on the national and state level. Construction of policy planning tools that can be used for analysis and evaluation of policies that impinge upon the economics and investment strategies of suppliers and/or consumers of various energy producing and consuming subsectors is discussed. GRA

N75-24141# Naval Intelligence Support Center, Washington, D.C. Translation Div.
THERMODYNAMICS OF LIQUID METAL MHD CONVERTERS
D. D. Kalafati and V. B. Kozlov 13 Feb. 1975 181 p refs Transl. into ENGLISH from Termodinam. Zhidkometallicheskikh MGD Preobrazovatelei, (Moscow), 1972
(AD-A007415; NISC-Trans-3622) Avail: NTIS CSCL 10/2

Contents: Thermophysical principles of liquid metal MHD converters; Thermodynamic cycles and heat systems of MHD converters with a liquid metal working substance; Basic principles for the thermodynamic analysis of cycles of liquid metal MHD converters; Thermodynamics of cycles with condensation of the vapor phase by mixing before the MHD generator; Thermodynamics of cycles with separation of vapor phase before the MHD generator; Thermodynamics of binary cycles for stationary power plants using liquid metal MHD converters. GRA

N75-24142# Army Chemical Center, Edgewood, Md.
PROCEEDINGS OF 5TH ANNUAL SYMPOSIUM: ENERGY RESEARCH AND DEVELOPMENT
Donald Falconer, Bernard Gerber, and William Magee Jan. 1975 179 p refs Conference held at Washington, D. C., 13-14 Mar. 1974; sponsored by the Amer. Defense Preparedness Assoc.
(AD-A007799; EO-SP-74026) Avail: NTIS CSCL 10/1

Contents: Energy research and development programs of the United States Department of the Interior; Energy R and D programs of the U.S. Atomic Energy Commission; National Science Foundation energy research and development programs; The

energy problem and defense; American Petroleum Institute; Coal research and development; Thermonuclear fusion energy; Pictorial overview of the hydrogen-energy concept; Review of power from the wind; Bioconversion of solar energy-photosynthesis; Enzymatic hydrolysis of cellulosic wastes; Coal liquefaction and gasification; Beneficial uses of waste heat from steam electric power plants; Energy systems analysis. GRA

N75-24143# Office of Oil and Gas, Washington, D.C.
VULNERABILITY OF NATURAL GAS SYSTEMS Final Report
Maynard M. Stephens and Joseph A. Golasinski Jun. 1974 130 p refs
(AD-A007583; OCD-PS-66-100) Avail: NTIS CSCL 21/4

This report describes the general manner and pattern in which the natural gas industry operates within the U.S. and describes in detail the transmission aspect of the system within the region encompassing all of Louisiana and thirteen counties of Mississippi. It brings together a description of all segments of the industry, relates some of the operational problems, and projects, in some instances, future problems as they relate to national security and emergency planning. GRA

N75-24144# Drexel Univ., Philadelphia, Pa.
UTILIZATION ANALYSIS OF ENERGY SYSTEMS Summary Report
H. L. Brown Jan. 1974 83 p
(Contract NSF GI-36598)
(PB-239291/8; NSF/RA/N-74-163) Avail: NTIS HC $4.75 CSCL 13A

An index of relative efficiency for energy systems in the commercial, industrial, and residential sector is developed. An effectiveness is developed based upon the concept of thermodynamic availability. Characterization of energy consumption in Philadelphia by census tracts using census data integrated with local utility data and a regional input-output study is covered. GRA

N75-24145# California Inst. of Tech., Pasadena. Guggenheim Jet Propulsion Center.
WORKSHOP PROCEEDINGS ON SOLAR COOLING FOR BUILDINGS, HELD IN CONJUNCTION WITH THE SEMIANNUAL MEETING OF THE AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE)
Francis deWinter 1974 241 p refs Proc. held at Los Angeles, 6-8 Feb. 1974
(Grant NSF AG-502)
(PB-239419/5; NSF/RA/N-74-063) Avail: NTIS MF $2.25; SOD HC $5.50 CSCL 13A

A partial listing of papers given at the workshop includes: overview of NSF solar energy program; costs of implementing new technology; product acceptance and market demand of the consumer; technical problems remaining; role of major urban government; current lithium bromide hardware as used in solar applications; solar heat pump system; ammonia and other absorption systems; solar assisted heat pumps; solar desiccant system analysis and materials; retrofittable solar dehumidifier; Heat engine using crystal transformations; and solar powered rankine cycle cooling systems. GRA

N75-24146# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
APPLIED RESEARCH ON 2 - 6 COMPOUND MATERIALS FOR HETEROJUNCTION SOLAR CELLS Quarterly Progress Report, 1 Jul. - 30 Sep. 1974
Richard H. Bube, Alan Fahrenbruch, Fredrik Buch, and Kim Mitchell Oct. 1974 41 p
(Grant NSF GI-38445)
(PB-239184/5; NSF/RANN/SE/GI-38445X/PR-74-3; NSF/RA/N-74-131) Avail: NTIS CSCL 10B

The development of p-CdTe/n-CdS heterojunction solar was facilitated by improvements in experimental apparatus, design and construction of new apparatus, and evaluation of films and cells made by both the close-spaced vapor transport (CSVT) method, and by vacuum evaporation. Cadmium telluride CdTe films were deposited by CSVT on single crystal CdS and on bulk and evaporated Ni; CdS films were deposited by CSVT on quartz and were made low resistivity by suitable heat treatment. A detailed investigation of the effects of heat treatment on evaporated CdS film on single crystal CdTe cells provides a number of insights into transport mechanisms at the junction; the reverse saturation current is caused by tunneling rather than by simple recombination-generation processes. GRA

N75-24147# Massachusetts Univ., Amherst. Energy Alternatives Program.
A PRELIMINARY TECHNOLOGY ASSESSMENT OF OCEAN THERMAL GRADIENT ENERGY GENERATION
Philip David Cloutier Jul. 1974 216 p refs
(Grant NSF GI-34979)
(PB-238646/4; NSF/RANN/SE/GI-34979/TR-74/1; NSF/RA/N-74-085) Avail: NTIS HC $7.25 CSCL 10B

A technology assessment of the Ocean Thermal Gradient Energy Generation process is discussed. The methodology developed consists of: defining the problem, defining alternative solutions to the problem, defining a set of goals to compare alternatives, defining the state of society or societal characteristics, carrying out impact analyses of the various alternatives, developing action-options to alleviate some of the adverse impacts, performing a final impact analysis, and presenting the overall and specific results for the Ocean Thermal Gradient Energy Generation process. The impact analysis is based on questionnaires that are evaluated by cross-impact matrix techniques. GRA

N75-24148# Electric Power Research Inst., Palo Alto, Calif.
CONFERENCE PROCEEDINGS, STEAM POWER PLANT WORKSHOP Special Report
George J. Silvestri, Jr. Apr. 1974 14 p Conf. held at Palo Alto, Calif. 4-5 Apr. 1974
(PB-239514/3; EPRI-SR-4) Avail: NTIS HC $3.25 CSCL 10B

The objectives were to assess current steam power plant technology, focusing on technological constraints, operational difficulties and potential research and development (R and D) funding by Electric Power Research Institute. GRA

N75-24149# California Univ., Berkeley. Dept. of Nuclear Engineering.
AERODYNAMIC DESIGN OF COOLING TOWER DRIFT ELIMINATORS
Shi-Chune Yao and Virgil E. Schrock Aug. 1974 107 p refs
(Grant NSF GI-34932)
(PB-238952/6; WHM-13; NSF/RA/N-74-102) Avail: NTIS HC $5.25 CSCL 10B

The characteristics of drift eliminators are studied parametrically for their blade shapes, solidity ratios, blade sizes, orientation with respect to gravity, approaching air speed and drift spectrum. The fundamental behavior of drift eliminator is revealed by nondimensional parameters. Methods for the optimum design of an eliminator considering minimum cost versus performances are developed. Suggestions on the design to improve the drainage of the collected water are given. GRA

N75-24150# Arizona Univ., Tucson. Optical Sciences Center.
SYMPOSIUM ON THE MATERIAL SCIENCE ASPECTS OF THIN FILM SYSTEMS FOR SOLAR ENERGY CONVERSION
B. O. Seraphin Jul. 1974 441 p refs Conference held at Tucson, Ariz., 20-22 May 1974
(Grant NSF GI-43795)
(PB-239270/2; NSF/RA/N-74-124) Avail: NTIS HC $11.25 CSCL 10B

Thin-film technology associated with solar thermal coatings and photovoltaics is discussed in terms of university, industrial, and governmental research. GRA

N75-24151# National Center for Energy Management and Power, Philadelphia, Pa.
AN APPROACH TO THE POWER SHORTAGE PROBLEM: OPTIMAL ALLOCATION OF EXISTING EXCESS RESERVES THROUGH INTERREGIONAL TRANSMISSION
Michael A. Moses 1 Aug. 1974 55 p
(Grant NSF GI-29729)
(PB-238578/9; NSF/RANN/SE/GI-29729/TR/73/2; NSF/RA/N-73-090) Avail: NTIS HC $4.25 CSCL 10A

A coordinated national grid system should lessen or eliminate the energy shortage. This idea relies on the presence of 'staggered peak loads' as the time zones from the East Coast to the West are transversed. When the New York City area experiences its peak demands between 12-2 P. M., the Los Angeles area is approximately three hours away from their peak. If L.A. could transfer electrical power to the east, the frequency of brown - or black-outs could be substantially decreased. This model attempts to work within the confines of existing capacity limits, and without decreasing demands. Efficient allocation and routes of distribution of electrical energy given the existing system capabilities are discussed. GRA

N75-24152# National Center for Energy Management and Power, Philadelphia, Pa.
THE RESIDENTIAL USER AND THE ELECTRICAL LOAD FACTOR
Kenneth A. Fegley Jul. 1973 40 p refs
(Grant NSF GI-29729)
(PB-238535/9; NSF/RANN/SE/GI-29729/TR/73/1) Avail: NTIS HC $3.75 CSCL 10A

The electrical load factor (the ratio of the average load to the peak load) has an important influence on the cost of delivering electrical energy to customers. The electrical use pattern for the average residential customer yields a low load factor for the individual residential customer and holds the total electric utility company load factor at a relatively low value. The relative importance of the residential customer in influencing the total load factor of the electric utility company is not likely to decrease in the future. There are a number of possible means for improving the residential load factor and so reap the very large savings that accompany a high total load factor for the electric utility company. GRA

N75-24153# Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Minerals Engineering.
DESIGN OPTIMIZATION IN UNDERGROUND COAL SYSTEMS Interim Report, Dec. 1973 - Jul. 1974
Dec. 1974 89 p refs
(Contract DI-14-32-0001-1231)
(PB-239075/5; OCR-91-INT-1) Avail: NTIS MF $2.25; SOD HC $3.45 as 163.10:91/INT.1 CSCL 08I

Progress is described on three areas of research. Under Part 1, longwall mining system strata simulator and structural parameters of coal measure rocks, a theoretical model of yield pillar design based on a three-dimensional finite element analysis, was developed. Work is underway on a photoelastic model technique to represent the effects of stratification. Current status is also described of parts 2 and 3, design criteria for underground roof-truss support systems, and vent-control, an expanded computer program for design of mining ventilation systems. GRA

N75-24154# Thermo Electron Corp., Waltham, Mass.
SOLAR ENERGY FOR PROCESS STEAM GENERATION
Jerry P. Davis 25 Nov. 1974 40 p ref Sponsored by NSF, Washington, D.C.
(PB-238109/3; TE-5392-34-75) Avail: NTIS HC $3.75 CSCL 13A

The performance and economic possibilities of process steam generation by the coupling of low temperature solar collectors (120-240F) producing low pressure saturated or wet steam to a fuel-driven diesel/compressor which compresses the steam to the desired final conditions (320F, 60 psig) are discussed. The system concept is analogous to a heat pump, which extracts low temperature ambient heat, and raises its temperature to a useful level via mechanical work. An economic evaluation of annual fuel savings, at $1.50/10 to the 6th power Btu fuel cost, to incremental investment required for $2/sq ft solar collectors or $4/sq ft solar collectors yielded 14 percent and 8 percent respectively. GRA

N75-24155# Bechtel Corp., San Francisco, Calif.
PATH TO SELF-SUFFICIENCY DIRECTIONS AND CONSTRAINTS, APPENDICES Final Report
Aug. 1974 267 p refs
(Grant NSF C-867)
(PB-239100/1; BECHTEL-10900-74-43-I-App) Avail: NTIS HC $8.50 CSCL 21D

A computer program that calculates resource requirements and summarizes results for any fuel mix is presented. The program tabulates an annual schedule of required facilities to be brought on-line and attendant annual schedules of capital (2 classes), manpower (4 types), and materials (9 categories) requirements. The model is exercised for two likely fuel mixes and the implications in terms of anticipated capital, manpower, and materials constraints are discussed. GRA

N75-24156# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
GLASS-Si HETEROJUNCTION SOLAR CELLS Quarterly Report, 1 Aug. - 30 Sep. 1974
Richard L. Anderson, Gordon Kent, and Steven Lai Oct. 1974 32 p
(PB-239282/7; NSF/RANN/SE/AER7417631/PR/74/3; NSF/RA/N-74-141; QR-3) Avail: NTIS HC $3.75 CSCL 10B

The feasibility of fabricating low-cost solar cells suitable for terrestial application is investigated. These cells consist of glass-silicon heterojunctions. Specific goals include the preparation and characterization of glass-monocrystalline Si and glass polycrystalline Si heterojunctions, and modeling of these devices. Heterojunction solar cells comprised of p-type semiconducting glass on n-type Si and n-type semiconducting glass on p-type Si are investigated. The glass acts as an integral part of the heterojunction, but is transparent to solar radiation, thus permitting the radiation to penetrate to the junction transition region. It also acts as a low resistance contact and as an antireflection coating. Although efforts at making p-glass/p Si cells have been unsuccessful to date, n-glass/n Si cells have been fabricated. These have short circuit currents of 40 ma/sq cm, open circuit voltages of 0.3 volts, and conversion efficiencies (AMI) of 5 percent. GRA

N75-24157# Maryland Univ., College Park. Dept. of Mechanical Engineering.
PROCEEDINGS OF THE SOLAR THERMAL CONVERSION WORKSHOP
E. R. G. Eckert, R. C. Jordan, E. M. Sparrow, G. K. Wehner, and J. W. Ramsey Nov. 1974 135 p refs Workshop held at Arlington, Va., 11-12 Jan. 1973
(Grant NSF GI-32488)
(PB-239277/7; NSF/RANN/SE/GI-32488/TR/73; NSF/RA/N-74-125) Avail: NTIS HC $5.75 CSCL 10A

Alternative means of collecting and storing solar heat energy to drive boilers of central-station steam-electric power plants are presented and discussed. Systems analysis aspects and means of forecasting the costs of solar thermal conversion power plants are included in the presentations. GRA

N75-24158# Booz-Allen, and Hamilton, Inc., Bethesda, Md.
THE IMPACT OF ENERGY SHORTAGES ON THE IRON AND STEEL INDUSTRIES Final Report
Aug. 1974 300 p refs
(Contract DI-14-01-0001-1657)
(PB-238749/6; FEA/EI-1657) Avail: NTIS HC $8.75 CSCL 10A

A study, conducted in an effort to obtain information on the basic structure or characteristics of the iron and steel industry, is reported. Particular emphasis is placed on fuel use by major type and production process as well as exploring the possibilities for fuel substitutability and conservation alternatives in the iron and steel industry. GRA

N75-24159# American Cyanamid Co., Stamford, Conn. Chemical Research Div.
RESEARCH ON CADMIUM STANNATE SELECTIVE OPTICAL FILMS FOR SOLAR ENERGY APPLICATIONS Quarterly Report, 1 Jul. - 30 Sep. 1974
Oct. 1974 33 p
(Grant NSF GI-39539)
(PB-239372/6; NSF/RANN/SE/GI-39539/PR-74-3; NSF/RA/N-74-134; QR-3) Avail: NTIS HC $3.75 CSCL 10B

The development of transparent and conductive cadmium stannate coatings was pursued with emphasis on the preparation of single phase film specimens. Efforts to prevent the formation of unwanted phases during deposition concentrated on adapting

the bias sputtering technique to the cadmium stannate film preparation. Although the deposition parameters involved have not yet been optimized, improved optical transmission characteristics were observed in some of the bias sputtered samples. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-24160 Maryland Univ., College Park.
REAL-TIME CHARACTERIZATION OF PARTICLES EMITTED BY COAL-FIRED POWER GENERATING PLANT Ph.D. Thesis
James Shiapin Whang 1974 184 p
Avail: Univ. Microfilms Order No. 75-4960

The size spectra, concentrations, and change with time of particulates emitted by a coal-fired power generating station with an electrostatic precipitator for fly ash emission control were examined. Simultaneous use of automated quartz-crystal microbalance mass monitor, integrating nephelometer, condensation nuclei counter and flame photometric SO2 analyzer were used to investigate this problem. Surveys were conducted by fixed ground stations, mobile ground stations, and airplane. The theoretical study and experimental results revealed that the condensation nuclei concentration and the light scattering coefficient are affected essentially by atmospheric dispersion (during the first hour of plume life), and both gravitational settling of particulates and atmospheric dispersion influence the mass concentration. Dissert. Abstr.

N75-24161 Illinois Univ., Urbana.
AN EXPERIMENTAL INVESTIGATION OF THE TURBULENT CHARACTERISTICS OF CO-AXIAL JET FLOWS AND THEIR ROLE IN AERODYNAMIC NOISE GENERATION Ph.D. Thesis
Robert John Hammersley 1974 214 p
Avail: Univ. Microfilms Order No. 75-11777

An experimental and analytical study of the velocity and pressure fields in the turbulent mixing regions of a co-annular jet was conducted. These results were applied to the prediction of the aerodynamic noise by jet flows. The work was performed on an isothermal, subsonic flow system; the co-annular nozzle configurations provided area ratios of 2.2 and 7.4 and velocity ratios ranging from 0.0 to 0.8 were examined. The turbulence measurements utilized standard constant temperature hot-wire anemometry techniques and a pressure transducer. The narrow-band space-time correlation model was applied to the prediction of the jet's far-field noise. The model was used to specify the source term in Ribner's formulation of the sound radiated by a turbulent pressure field. The results were compared to measured noise levels and the dependence upon the several input parameters was discussed. Dissert. Abstr.

N75-24162*# Michigan Univ., Ann Arbor. Space Physics Research Lab.
ASSESSMENT OF POSSIBLE ENVIRONMENTAL EFFECTS OF SPACE SHUTTLE OPERATIONS
R. J. Cicerone, D. H. Stedman, R. S. Stolarski, A. N. Dingle, and R. A. Cellarius Jun. 1973 88 p refs
(Contract NAS8-28294)
(NASA-CR-129003) Avail: NTIS HC $4.75 CSCL 13B

The potential of shuttle operations to contribute to atmospheric pollution is investigated. Presented in this interim report are results of the study to date on rocket exhaust inventory, exhaust interactions, dispersion of the ground cloud, detection and measurement of hydrochloric acid and aluminum oxide, environmental effects of hydrochloric acid and aluminum oxide, stratospheric effects of shuttle effluents, and mesospheric and ionospheric effects of orbiter reentry. The results indicate space shuttle operation will not result in adverse environmental effects if appropriate launch constraints are met. Author

N75-24163*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF SILVER, COBALT, AND STRONTIUM FROM POLLUTED WATERS
B. C. Wolverton and R. C. McDonald May 1975 14 p refs
(NASA-TM-X-72727) Avail: NTIS HC $3.25 CSCL 06F

Water hyacinths and alligator weeds demonstrated the ability to rapidly remove heavy metals from an aqueous system by root absorption and concentration. Water hyacinths demonstrated the ability to remove 0.439 mg of silver, 0.568 mg of cobalt, and 0.544 mg of strontium in an ionized form per gram of dry plant material in a 24-hour period. Alligator weeds removed a maximum of 0.439 mg of silver, 0.130 mg of cobalt, and 0.161 mg of strontium per gram of dry plant material per day. Author

N75-24164*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTERDISCIPLINARY STUDY OF ATMOSPHERIC PROCESSES AND CONSTITUENTS OF THE MID-ATLANTIC COASTAL REGION. ATTACHMENT 5: DATA SET FOR BACKGROUND INVESTIGATION OF ATMOSPHERIC CONSTITUENTS FOR RICHMOND, VIRGINIA AREA
Earl C. Kindle, Alan Bandy, Gary Copeland, Roger Blais, Gerald Levy, Daniel Sonenshine, Donald Adams, and George Maier May 1975 108 p
(Grant NGR-47-003-067)
(NASA-CR-142822) Avail: NTIS HC $5.25 CSCL 01A

Background data is provided for the photochemical oxident problem in the Richmond area. Particulate data, digitized portrayal of site molecular and meteorological data, and graphical portrayal of molecular data, hourly meteorological data, and streamflow charts and radiosonde data are also given. M.J.S.

N75-24165# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, May 1973 [POLLUTION ATMOSPHERIQUE. I.FUMEE ET SO2 II.MESURE DES RETOMBEES SU MOYEN DES JAUGES DE DEPOT]
May 1973 40 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.75

Data obtained at Belgian weather stations for May 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N75-24166# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION. PART 1: SMOKE AND SULFUR DIOXIDE. PART 2: PRECIPITATION MEASUREMENTS USING STORAGE GAGES Monthly Bulletin, Jun. 1973 [POLLUTION ATMOSPHERIQUE I.FUMEE ET SO2 II.MESURE DES RETOMBEES AU MOYEN DES JAUGES DE DEPOT BULLETIN MENSUEL, JUIN 1973]
Jun. 1973 37 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.75

Data obtained at Belgian weather stations for June 1973 are tabulated. The air pollution apparatus and rain gage are briefly described. ESRO

N75-24167# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).
THE DYNAMICS OF ADSORPTION OF VAPOURS BY POROUS ADSORBENTS IN FIXED BEDS. (BREAK-THROUGH CURVES OF SARIN ON CHARCOAL IN THE VERY LOW CONCENTRATION REGION)
R. H. VanDongen and P. C. Stamperius Aug. 1974 53 p refs
(TDCK-65300; CL-1974-4) Avail: NTIS HC $4.25

Adsorption dynamics of a packed charcoal bed were studied. Theory was modified and extended taking into account the special binary porous structure of charcoal pellets. The concepts of statistical moments and height of a transfer unit useful tools in the analysis and interpretation of break-through curves and elution peaks, are discussed. An expression for the very low concentration region of the break-through curve was derived and compared to experimental data of the initial breakthrough curves of sarin on Norit 1 mm impregnated charcoal. Charcoal was equilibrated at 70 and 90 percent R.H. and loaded with sarin/air mixtures of

the corresponding R.H.'s. There are indications that the adsorption efficiency for moist charcoal is largely determined by axial dispersion in the air stream and the mass transfer to the outer surface of the charcoal pellets. Author (ESRO)

N75-24168# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).
NON-DESTRUCTIVE TEST OF CHARCOAL FILTERS. PART 3: CHARACTERISTICS OF THE ELUTION PEAKS OF ETHANE AND PROPANE ON PARTIALLY SPENT CHARCOAL FILTERS OF VARIOUS MOISTURE CONTENTS
R. H. VanDongen 1974 29 p refs
(TDCK-65348; CL-1974-5) Avail: NTIS HC $3.75

Adsorption dynamics of ethane and propane on packed charcoal beds were investigated from the elution peaks of these weakly adsorbed gases. The elution peaks characterized with the first and second statistical moment and with the height of a transfer unit. The effects of absorbed water and bed loading with chloropicrin were studied. It is shown that there is little use in pursuing this line of research on nondestructive tests since these gases absorb too weakly on moist charcoal to give any significant change in elution peak characteristics at various degrees of loading. Author (ESRO)

N75-24169# Research Triangle Inst., Durham, N.C. Office of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 2. PLAN PREPARATION Final Report
Jul. 1974 158 p ref Prepared in cooperation with EPA, Research Triangle Park, N. C.
(Contract EPA-68-02-1386)
(PB-237581/4; EPA-450/4-74-002; OAQPS-1.2-021-Vol-2) Avail: NTIS HC $6.25 CSCL 13B

The procedures to be followed and anlytical methods to be employed in developing an air quality maintenance plan are described for those areas that have been identified as having the potential of exceeding the national ambient air quality standards, because of present air quality of projected growth. Procedures are described for projecting air quality through 1985, estimating associated air quality, and identifying and quantifying any potential air quality maintenance problem. Using this analysis as a base, procedures for developing alternative maintenance strategies and selecting a feasible strategy are presented. Methods of evaluating social and economic impact of maintenance strategies are included. GRA

N75-24170# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 3: CONTROL STRATEGIES Final Report
Jul. 1974 189 p ref Prepared in cooperation with Research Triangle Inst., Durham, N. C. and PEDCO-Environmental Specialists, Inc., Cincinnati 12 Vol.
(Contract EPA-68-02-1386)
(PB-237582/2; EPA-450/4-74-003; OAQPS-1.2-022-Vol-3) Avail: NTIS HC $7.00 CSCL 13B

Measures used or proposed for use in maintaining air quality standards in regional areas are described. Information is assembled on current applications, recommendations for implementing, estimates of potential effectiveness, and conditions under which the measure is most applicable. Many of the measures are based on land-use or regional planning and are concerned with new sources of emissions. Emission allocation procedures, emission density zoning, zoning approvals, transportation controls, emission charges, transfer of emission source location, indirect source review, and environmental impact statements. GRA

N75-24171# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 4: LAND USE AND TRANSPORTATION CONSIDERATIONS Final Report
Aug. 1974 124 p refs Prepared in cooperation with Voorhees, (Alan M.) and Associates, Inc., McLean, Va.
(Contract EPA-68-02-1388)
(PB-237583/0; EPA-450/4-74-004; OAQPS-1.2-023-Vol-4) Avail: NTIS HC $5.25 CSCL 13B

Methods and practice in land use and transportation planning are described along with the development and uses of comprehensive plans. General approaches are offered for comprehensive planning and for evaluating impacts of land use and air quality plans and policies. Information, organization and analytical technique necessary for relating land use and transportation to air quality are discussed. GRA

N75-24172# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 6. OVERVIEW OF AIR QUALITY MAINTENANCE AREA ANALYSIS
Sep. 1974 44 p refs
(PB-237584/8; EPA-450/4-74-007-Vol-6;
OAQPS-1.2-025-Vol-6) Avail: NTIS HC $3.75 CSCL 13B

Elements of air quality maintenance area analysis are described and include design and update of emission, meteorological and air quality data bases; use of dispersion models and air quality data to estimate present air quality; projection of future emissions and emission distribution patterns; use of models to estimate future air quality; and assessment of whether control strategies are sufficient to meet air quality requirements in the future. GRA

N75-24173# Booz-Allen, and Hamilton, Inc., Bethesda, Md. Office of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 7. PROJECTING COUNTY EMISSIONS
Sep. 1974 133 p
(Contract EPA-68-02-1005)
(PB-237611/9; EPA-450/4-74-008-Vol-7;
OAQPS-1.2-026-Vol-7) Avail: NTIS HC $5.75 CSCL 13B

A specific and uniform methodology to upgrade existing emission inventories and to forecast future emissions of air pollutants within small geographical areas is defined. The techniques presented are designed to be used by state and local air pollution control personnel in compiling baseline data for the state plans to maintain national ambient air quality standards. GRA

N75-24174# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 8: COMPUTER-ASSISTED AREA SOURCE EMISSION GRIDDING PROCEDURE
Sep. 1974 102 p refs Prepared in cooperation with Research Triangle Inst., Durham, N. C.
(PB-237585/5; EPA-450/4-74-009-Vol-8; OAQPS-1.2-027) Avail: NTIS HC $5.25 CSCL 13B

A semi-automatic method for distributing area source emissions on a sub-county basis is presented. Demographic information for census tracts within the county is used as the basis for the distribution of the emissions. Override factors are inserted for each designated sub-area within the county. The methodology is used to estimate present emission distributions in the air quality maintenance analysis procedure and to estimate future distributions of area source emissions. GRA

N75-24175# GEOMET, Inc., Rockville, Md.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 10: REVIEWING NEW STATIONARY SOURCES Report, Jan. - Aug. 1974
Sep. 1974 89 p refs
(Contract EPA-68-02-1094)
(PB-237535/0; GEOMET-EF-326-Vol-10;
EPA-450/4-74-011-Vol-10; OAQPS-1.2-029-Vol-10) Avail: NTIS HC $4.75 CSCL 13B

Methods for assessing the impact of proposed point sources of pollution on maximum short term ambient concentrations and on annual mean ambient concentrations are presented. The importance of control devices, stack characteristics, meteorological

and topographical influences in determining a source's impact on ambient air quality is discussed. GRA

N75-24176# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENENCE PLANNING AND ANALYSIS: VOLUME 11: AIR QUALITY MONITORING AND DATA ANALYSIS
Sep. 1974 114 p refs Prepared in cooperation with GCA Corp., Bedford, Mass.
(PB-237626/7; EPA-450/4-74-012-Vol-11; OAQPS-1.2-030-Vol-11) Avail: NTIS HC $5.25 CSCL 13B

Air quality monitoring and data analysis is discussed in terms of air quality maintenance. The quality, type, temporal, and geographical distribution of air quality data necessary for establishing baseline air quality levels are presented. GRA

N75-24177# Environmental Protection Agency, Research Triangle Park, N.C. Office Of Air Quality Planning and Standards.
GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 12: APPLYING ATMOSPHERIC SIMULATION MODELS TO AIR QUALITY MAINTENANCE AREAS
Sep. 1974 54 p refs
(PB-237750/5; EPA-450/4-74-013-Vol-12; OAQPS-1.2-031-Vol-12) Avail: NTIS HC $4.25 CSCL 13B

A description of pollution data requirements, spatial and temporal resolution, reliability and applicability to criteria is presented for three categories of atmospheric simulation models. Categories are distinguished on the basis of their emission characteristics: level 1 requires an estimate of total emissions in the air quality maintenance are a (AQMA); level 2 apportions total emissions into subareas within the AQMA and expresses the apportioned emissions as emission densities; level 3 allows explicit treatment of point, line, and area sources of pollution. Several models in each category are described, and their applicability to air quality maintenance programs is discussed. GRA

N75-24178# Environmental Protection Agency, Washington, D.C. Office of Monitoring Systems.
PROCEEDINGS OF SEMINAR ON METHODOLOGY FOR MONITORING THE MARINE ENVIRONMENT
S. S. Verner Oct. 1974 436 p refs Seminar held in Seattle, Oct. 1973
(PB-239052/4; EPA-600/4-74-004) Avail: NTIS MF $2.25; SOD HC CSCL 13B

The following topics are considered: Mathematical modeling as a framework for coastal monitoring; problems in measuring turbidity as a water quality parameter; surface slick sampling and analysis; a systems approach to marine pollution monitoring; methods and problems in analysis of pesticides in the estuarine environment; biological problems in estuarine monitoring; determination of metals in sea water; summary of recent studies on biological effects of crude oils and oil-dispersant mixtures to the Red Sea and absorption of orthophosphates on borosilicate and 'citrate of magnesia bottles' polyethylene and polyvinyl surfaces in a distilled water and seawater matrix. GRA

N75-24179# Research Triangle Inst., Durham, N.C.
SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY Final Report
Franklin A. Ayer Oct. 1974 356 p refs Conference held at St. Louis, 13-15 May 1974
(Contract EPA-68-02-1325)
(PB-238304/0; EPA-650/2-74-118) Avail: NTIS HC $10.00 CSCL 13B

This document is the final report covering EPA's symposium to review and discuss environmentally related information of coal conversion technology. More specifically, papers were presented that covered environmental quality and standards, fuel contaminants, environmental aspects of specific fuel conversion systems, fuel utilization and total environmental assessment, and research and development needs. GRA

N75-24180# Systems Applications, Inc., San Rafael, Calif.
MATHEMATICAL SIMULATION OF SMOG CHAMBER PHOTOCHEMICAL EXPERIMENTS Final Report
Thomas A. Hecht, Mei-Kao Liu, and David C. Whitney Nov. 1974 193 p refs
(Contract EPA-68-02-0580)
(PB-238094/7; EPA-650/4-74-040; R74-9) Avail: NTIS HC $7.00 CSCL 04A

The development and testing of a general kinetic mechanism for photochemical smog formation is reported. Several rate constant values were updated, and simulations of n-butane/NOx, propylene/NOx, and n-butane/propylene/NOx smog chamber experiments were repeated. A sensitivity analysis of the mechanism was carried out, and the results were combined with uncertainty estimates of the rate constants to quantify the importance of determining individual rate constants with greater accuracy. The validity of the steady-state approximation in simulating smog chamber experiments and some techniques for mathematically combining a number of similar organic species into general groupings are discussed. GRA

N75-24181# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
RELATIVE DISPERSION WITHIN THE LOS ANGELES BASIN AS ESTIMATED FROM TETROON TRIADS
J. K. Angell, C. R. Dickson, and W. H. Hoecker Nov. 1974 41 p refs
(COM-75-10197/2; NOAA-TM-ERL-ARL-46; NOAA-75012404) Avail: NTIS HC $3.75 CSCL 13B

The Los Angeles Reactive Pollutant Project (LARPP) involved helicopter sampling of a volume of air 'tagged' by means of three constant volume balloons (tetroons) released simultaneously from the same point on the ground. Based on radar tracking of 35 tetroon triads at a mean height 350 meters above sea level, the variation of lateral and longitudinal standard deviation of tetroon position with travel time and distance is considered. The derived relative dispersion in the Los Angeles Basin is compared with results obtained in other locales. GRA

N75-24182# Northeastern Illinois Planning Commission, Chicago.
BIOGRAPHY ON THE PLANNING ASPECTS OF AIR POLLUTION CONTROL, SUMMARY AND EVALUATION
Wm. J. Pelle, Jr. 18 Dec. 1974 28 p refs Sponsored in part by PHS
(PB-238927/8) Avail: NTIS HC $3.75 CSCL 13B

An examination is made of the literature covering planning principles in terms of their applicability to air pollution control. Subject matter is broken down into six major subheadings: elementary microclimatological considerations in city planning; relationship of air pollution to the 'image' of the city; effects of 'green areas' in air pollution control; relationship of transportation to air pollution; relationship of air pollution control to development patterns; and regulation of pollution through performance standards and densities of population, industry, and traffic. GRA

N75-24183# National Bureau of Standards, Washington, D.C.
MARINE POLLUTION MONITORING (PETROLEUM): PROCEEDINGS OF A SYMPOSIUM AND WORKSHOP HELD AT THE NATIONAL BUREAU OF STANDARDS
R. C. Junghans Dec. 1974 293 p refs Conf. held in Gaithersburg, Md., 13-17 May 1974 Sponsored in part by World Meteorological Organization, Geneva
(COM-75-50071/0; NBS-SP-409) Avail: NTIS MF $2.25; SOD HC as C13.10:409 CSCL 13B

Pertinent scientific, environmental, and regulatory aspects of petroleum hydrocarbon measurements are discussed along with specific scientific developments and recommendations. Specific recommendations for the initiation of a coordinated project for marine pollution monitoring are given. The following major areas are discussed: sampling methods and techniques; oil slicks, tar balls, and particulates; standards and intercomparison criteria; oil in marine organisms and sediments; and analytical methods and biological assessment. GRA

N75-24184# Michigan State Univ., East Lansing. Inst. of Water Research.
SPRING AND FALL THERMAL BAR DEVELOPMENT IN LAKE SUPERIOR Completion Report

Davis W. Hubbard and James D. Spain Dec. 1974 22 p refs Prepared in cooperation with Michigan Technological Univ.
(Contract DI-14-31-0001-4022)
(PB-239227/2; W75-04038; OWRT-A-071-MICH(1)) Avail: NTIS HC $3.25 CSCL 13B

The thermal bar is a downwelling phenomenon which occurs parallel to the shore during the spring warming and the fall cooling of large temperate zone lakes. The thermal bar is of practical interest because it traps pollutants in the near-shore zone during certain seasons of the year. The fine structure of the Lake Superior thermal bar was studied during the spring and fall of 1974 with approximately 16 transects being made across the bar using a digital thermistor thermometer capable of 0.01C accurracy in the vicinity of 4C. Data were plotted by computer using the SYMAP program. Natural flourescence arising from land runoff was employed to distinguish between inshore and offshore water masses. GRA

N75-24185# KVB Engineering, Inc., Tustin, Calif.
FIELD TESTING: APPLICATION OF COMBUSTION MODIFICATIONS TO CONTROL POLLUTANT EMISSIONS FROM INDUSTRIAL BOILERS, PHASE 1 Final Report, Jun. 1973 - Jul. 1974
G. A. Cato, H. J. Buening, C. C. DeVivo, B. G. Morron, and J. M. Robinson Oct. 1974 213 p refs
(Contract EPA-68-02-1074)
(PB-238920/3; SN-6000-28; EPA-650/2-74-078-A) Avail: NTIS HC $7.25 CSCL 13B

Results of field measurements made on 47 representative industrial boilers of 10,000-500,000 lb/hr of steam capacity are given. Pollutants measured were total nitrogen oxides (NOx), total particulates, total sulfur oxides, CO2, CO, and hydrocarbon. Measurements were made of emissions from coal, oil, and natural gas fuels and a variety of coal stoker and oil atomization methods. The effectiveness of reduced excess air, reduced load, air register readjustment, and off-stoichiometric firing in reducing NOx emissions is evaluated. GRA

N75-24186# Informatics, Inc., Rockville, Md.
CIVIL AVIATION STUDIES AND INTERAGENCY COORDINATING ORGANIZATIONS, VOLUME 1
Carl Modig Dec. 1974 165 p refs 2 Vol.
(Contract EPA-68-01-2229)
(PB-239344/5; EPA-550/9-74-019A-Vol-1) Avail: NTIS HC $6.25 CSCL 01C

Federal organizations set up to coordinate civil aviation policy are described, including those dealing with the aircraft noise problem and commissions and agency task groups who studied civil aviation problems. The evolution of these organizations from after World War II to the present is traced. It is concluded that: (1) in the early 1960's there was no institution actively coordinating federal aircraft noise abatement activities; (2) much of the impetus for better coordination has come from Congress; (3) successful coordination requires high-level agency and Administration support; (4) the host agency may have difficulty securing cooperation of other agencies. GRA

N75-24187# Informatics, Inc., Rockville, Md.
CIVIL AVIATION STUDIES AND INTERAGENCY COORDINATING ORGANIZATIONS, VOLUME 2: APPENDICES
Carl Modig Dec. 1974 180 p refs 2 Vol.
(Contract EPA-550/9-74-019B)
(PB-239345/2; EPA-550/9-74-019B-Vol-2) Avail: NTIS HC $7.00 CSCL 01C

Source documents are reproduced in whole or in part to provide more detailed information on various federal organizations set up to coordinate or study civil aviation policy, including those dealing with the aircraft noise problem. GRA

N75-24188# Naval Ordnance Lab., White Oak, Md.
A METHOD FOR THE SEPARATION OF OIL FROM AN AQUEOUS OIL, DETERGENT SOLUTION PRIOR TO IR ANALYSIS, PART 2 Final Report
Charles E. Adams 9 Sep. 1974 13 p
(SF53554706)
(AD-A006826; NOLTR-74-164) Avail: NTIS CSCL 09/3

This report presents additional work on an analytical method for the determination of oil in water solutions in the presence of dissolved detergents. A previous report describes a method for the removal of the oil by a silica-gel treatment and the subsequent analysis of the oil in a CCl4 extract using an IR spectrophotometer. The work covered by this report is concerned with testing and improving the analytical method and working out a standard operating procedure. GRA

N75-24189# Air Products and Chemicals, Inc., Marcus Hook, Pa. Houdry Div.
ENGINEERING AND COST STUDY OF AIR POLLUTION CONTROL FOR THE PETROCHEMICAL INDUSTRY. VOLUME 1: CARBON BLACK MANUFACTURE BY THE FURNACE PROCESS Final Report
W. A. Swartz, F. B. Higgins, Jr., J. A. Lee, R. Newirth, and J. W. Pervier Jun. 1974 127 p refs 12 Vol.
(Contract EPA-68-02-0255)
(PB-238324/8; EPA-450/3-73-006-A-Vol-1) Avail: NTIS HC $5.75 CSCL 13B

The manufacture of carbon black by the furnace process is described. An engineering description of available emission control systems, the cost of these systems, and the financial impact of emission control on the industry are included. Air episode procedures and plant inspection procedures are suggested. GRA

N75-24190# Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIOISOTOPES AND GLOBAL TRANSPORT IN THE ATMOSPHERE
I. L. Karol 1974 337 p refs Transl. into ENGLISH of the book "Radioaktivnye Izotopy i Globalnyi Perenos v Atmosphere" Leningrad, Gidrometeoizdat, 1972 Sponsored by US-Israel Binatl. Sci. Found.
(TT-74-50025) Avail: NTIS CSCL 13B

Measurements of natural and artificial radioactivity of the atmosphere are summarized to explain the global circulation of air masses in the troposphere. Most measurements pertain to radioactive isotopes. Present concepts are classified of global circulation and radioactive aerosol removal in the troposphere and stratosphere in the form of a single guantitative model, and the model's parameters were determined from climatic data and measured isotope contents in the atmosphere and precipitation. The model was used for studying air-mass transport characteristics in different parts of the atmosphere, and global spread of contaminants from local sources, and also for calculating the planetary concentration fields of some natural radioisotopes. A critical survey of other quantitative models of global contaminant spread is presented. Author

N75-24191# Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
PETROLEUM DEGRADATION IN LOW TEMPERATURE MARINE AND ESTUARINE ENVIRONMENTS Annual Report, 1 May - 31 Dec. 1974
Richard W. Traxler and Anthony M. Cundell Mar. 1975 30 p refs
(Contract N00014-68-A-0215-0013; NR Proj. 133-076)
(AD-A007588; AR-2) Avail: NTIS CSCL 06/13

Enrichment of hydrocarbon and fuel oil utilizing bacteria was shown following an oil spill in Narragansett Bay and chemical analyses of sediments from the spill site confirmed the role of biodegradation. Biodegradation did occur during the winter months at a rate of 1-1.8 micrograms of hydrocarbon per gram of sediment per day. Laboratory culture and BOD methods showed degradation rates higher than the measured in situ rates but demonstrated the presence of psychrophilic hydrocarbon metabolizing microbial populations in the natural environment during the winter. Laboroatory Q10 values at 10 and 20C for psychrotolerant isolates were less than 2.0. Filamentous fungi were isolated which metabolized petroleum hydrocarbons with the formation of inclusions peculiar to hydrocarbon grown cultures. GRA

N75-24192# ARO, Inc., Arnold Air Force Station, Tenn.
DROPLET DIAMETER AND SIZE DISTRIBUTION OF JP-4 FUEL INJECTED INTO A SUBSONIC AIRSTREAM Final Report, 22 Oct. - 12 Dec. 1973
R. A. Wasson, Jr., C. R. Darlington, and J. C. Billingsley AEDC Apr. 1975 43 p refs
(AD-A007687; ARO-ETF-TR-74-92; AEDC-TR-74-117) Avail: NTIS CSCL 21/4

A test program was conducted to determine the size and distribution of JP-4 fuel droplets when fuel was dispersed at a constant fuel nozzle exit velocity into a subsonic airstream. Testing was conducted at free-stream flight velocities ranging from 200 to 400 knots at altitudes ranging from 12,000 to 25,000 feet with flow rates of approximately 13, 75, and 290 lbm/min. Holograms of the fuel droplets were taken 18 feet downstream of the fuel nozzle exit plane. Representative histograms of fuel droplet size distribution and average fuel droplet diameter are presented. Average fuel droplet diameter was not significantly affected by any of the test variables. All arithmetic average fuel droplet diameter data were within a 19- to 36-micrometer band. GRA

N75-24193# Israel Program for Scientific Translations, Ltd., Jerusalem.
NOISE ABATEMENT
V. Chudnov 1974 84 p Transl. into ENGLISH of the book "V Poiskakh Tishiny" Moscow, 1971 Sponsored in part by NSF and EPA
(TT-73-50040) Avail: NTIS HC $4.75 CSCL 06F

Contents: noise as a social nuisance; the enemy of health; decibels and industry; urban noise; we are all neighbors; rural complaints; the quest for quiet; and planning quiet. GRA

N75-24194# Kansas State Univ., Manhattan.
MATHEMATICAL SIMULATION OF AN ADSORBER FOR POLLUTANT REMOVAL Final Environmental Protection Technology Series, Jun. 1972 - Dec. 1973
L. T. Fan Oct. 1974 92 p refs
(Grant EPA-R-800316)
(PB-239331/2; EPA-650/2-74-110) Avail: NTIS HC $4.75 CSCL 13B

A comprehensive survey of the literature on design and operational aspects of processes for adsorbing gaseous pollutants is given. Mathematical models of these processes are also summarized. Mathematical models for the adiabatic adsorption processes in a fixed bed of adsorbent are presented. The models are based on the mechanisms of external mass transfer rate control a Langmuir type isotherm. The transient solution is presented for the dynamic adsorbate concentrations and temperature at various positions of the bed. Results of the studies on the effects of various parameters are also presented. A single fixed bed pollutant adsorber is described which is operated cyclically by synchronizing the change in the direction of the gaseous flow with the change in temperature. Two operational schemes are presented for such a system. GRA

N75-24195# Gulf Research and Development Co., Pittsburgh, Pa.
POLYNUCLEAR AROMATIC CONTENT OF HEAVY DUTY DIESEL ENGINE EXHAUST GASES Annual Report
R. S. Spindt Jul. 1974 71 p refs
(Contract EPA-68-01-2116)
(PB-238688/6; AR-1) Avail: NTIS HC $4.25 CSCL 13B

The effort was concentrated on validation of the sample collection and analytical techniques and a survey of the PNA content of U.S. diesel fuels. A collection system consisting of a precooler, a glass fiber particulate filter, and a Chromosorb-102 trap was used to collect PNA's from diesel exhaust. PNA's are removed from the collection system by solvent washing and soxhlet extraction, concentrated, and analyzed by thin layer chromatography. Attempts to validate the sample collection system using C(14) tracers were not successful. Radio tracers also indicate that PNA-destroying reactions occur even after collection and extraction from the sample system. GRA

N75-24196# Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH VINYL CHLORIDE AND POLYVINYL CHLORIDE Interim Report
Sep. 1974 106 p refs
(PB-239110/0; EPA-560/4-74-001) Avail: NTIS HC $5.25 CSCL 13B

The report summarizes the activities and findings of a task force to assess the character and extent of the problems associated with the production, distribution, use, and disposal of vinyl chloride and polyvinyl chloride. The first Section discusses the nature and magnitude of problems. The second discusses previous and planned activities within the Federal Government of particular significance and the role of industry. The report concludes with some specific recommendations. GRA

N75-24197# System Development Corp., Santa Monica, Calif.
COMPREHENSIVE TECHNICAL REPORT ON ALL ATMOSPHERIC CONTAMINANTS ASSOCIATED WITH PHOTOCHEMICAL AIR POLLUTION Environmental Monitoring Series
Lowell G. Wayne, Robert J. Bryan, Mel Weisburd, and Roy Danchick Jun. 1970 510 p refs
(Contract AP-22-69-108)
(PB-239510/1; SDC-TM-L-4411/002/01; EPA-650/4-75-002) Avail: NTIS HC $12.25 CSCL 13B

The interrelationships are analyzed of contaminant, environmental, and source factors involved in the total photochemical pollution system. The intent is to generalize the principles and techniques of photochemical-environmental appraisal for application to other regions of the United States. Specifically, this document analyzes illustrative applications of techniques for appraising air quality and predicting its trends. These techniques include, multivariate statistical analysis of information obtained from air monitoring, and simulation modeling for studying future interactions of reactive contaminants. GRA

N75-24198# Berkshire County Regional Planning Commission, Pittsfield, Mass.
EVALUATION OF POWER FACILITIES; A REVIEWER'S HANDBOOK Final Report
Apr. 1974 392 p refs Prepared in cooperation with Curran Associates, Inc.
(PB-239221/5) Avail: NTIS HC $10.25 CSCL 10B

The handbook identifies and discusses the positive and negative impacts of power facilities on regional and local areas. The emphasis is on assisting planners in developing the local perspective of evaluation and to prepare them for an active participatory role in decision-making. In order that the comprehensive aspects of power facilities be fully explored, breadth rather than depth is emphasized. It thus serves as a primer addressed to planners, citizens and public agencies with the intent of imparting an objective and unbiased understanding of the major issues involved in the planning, design, licensing, construction, operation, and regulation of generation and transmission facilities. It further analyzes and summarizes the mass of regulatory legislation. GRA

N75-24199# Abcor, Inc., Cambridge, Mass. Walden Research Div.
ANALYSIS OF THE COMPOSITION OF THE ATMOSPHERE IN THE LOS ANGELES BASIN Final Report
John R. Ehrenfeld May 1974 81 p refs
(Contract EPA-68-02-0218)
(PB-239466/6; EPA-650/2-74-105) Avail: NTIS HC $4.75 CSCL 13B

A material balance model and an inversion technique was developed that appear to produce reasonable estimates of the contribution of different emission sources in the Los Angeles atmosphere. Different sources exhibit very characteristic diurnal and daily patterns. The automobile exhaust contribution to the hydrocarbon burden on weekdays was found to be different from that on weekends. Estimates of the loss of reactive compounds such as ethylene and propylene were made and these compare favorably with smog chamber data. GRA

N75-24200# National Ecological Research Lab., Corvallis, Oreg.
A CONCEPTUAL MODEL FOR THE MOVEMENT OF PESTICIDES THROUGH THE ENVIRONMENT: A CONTRIBUTION OF THE EPA ALTERNATIVE CHEMICALS PROGRAM Final Report
James W. Gillett, James Hill, IV, Alfred W. Jarvinen, and W. Peter Schoor Dec. 1974 89 p refs
(PB-238653/0; EPA-660/3-74-024) Avail: NTIS HC $4.75 CSCL 13B

A conceptual model of the movement and disposition of pesticides in the environment is reported that is built up from

simple modules representing basic processes and components of air, soil, and water. More specific models are exposited for the atmospheric/terrestrial, freshwater aquatic, and estuaring/marine environments. Ultimately systems analysis and mathematical simulation techniques can be employed to evaluate the fate of a specific chemical in a particular environment. The conceptual model is thus a first step in organizing facts, assumptions, and hypotheses into a graphic and logical arm capable of exploitation in further experimentation of pesticide disposition and effects.
GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N75-24201 Ohio State Univ., Columbus.
DIRECT RECOVERY OF MEAN GRAVITY ANOMALIES FROM SATELLITE TO SATELLITE TRACKING Ph.D. Thesis
Dhaneshwar Prasad Hajela 1974 276 p
Avail: Univ. Microfilms Order No. 75-11353

Direct recovery of mean gravity anomalies from summed range rate observations is studied, the signal path being ground station to a geosynchronous relay satellite to a close satellite significantly perturbed by the short wave features of the earth's gravitational field. To ensure realistic observations, these were simulated with the nominal orbital elements for the relay satellite corresponding to ATS-6, and for two different close satellites one at about 250 km height, and the other at about 900 km height corresponding to the nominal values for GEOS-C. The earth's gravitational field was represented by a reference set of potential coefficients up to degree and order 12, considering as known values, and by residual gravity anomalies obtained by subtracting the anomalies implied by the potential coefficients from their terrestrial estimates. Dissert. Abstr.

N75-24202 Pennsylvania State Univ., University Park.
THE ROLE OF ICE PARTICULATES IN THE ELECTRIFICATION OF THE AIR IN THE MESOSPHERE Ph.D. Thesis
E. Thomas Chesworth 1974 126 p
Avail: Univ. Microfilms Order No. 75-9766

The observations of noctilucent clouds, the measurements of hydrated ions, and the light-scattering layer detected by the OGO-6 satellite suggest the presence of ice crystals in the mesosphere. The correlation between temperature and positive ion mobility where the vapor pressure over ice becomes greater than atmospheric pressure just above the stratopause indicates the presence of ice crystals throughout the mesosphere at all latitudes during all seasons. Confirmation of this theory is provided by the numerical value of the logarithmic derivative of positive ion conductivity being within 8% of the specific entropy change when ice sublimes. It is shown that 1000 to 10,000 ice crystals per cu cm of order 100 A in diameter dominate electron loss processes in the upper mesosphere. The theory explains the ledge at 83 km and validates the positive ion density measurements of Hale. Dissert. Abstr.

N75-24203 Pennsylvania State Univ., University Park.
THEORY AND PRACTICE OF GEOPHYSICAL SURVEY DESIGN Ph.D. Thesis
Thomas M. Davis 1974 147 p
Avail: Univ. Microfilms Order No. 75-9770

A theory for designing parallel track-type geophysical surveys, as well as the necessary numerical algorithms for implementing the theory, is developed and applied to various sampling problems. The basic procedures of survey design are based upon one and two-dimensional Fourier transforms applied to appropriate numerical models of the sampling process in order to estimate the variance or mean square error as well as the spectral content of the sampling error. These error estimates are computed in the spatial frequency domain, and application of the convolution theorem is shown to produce a particularly efficient process for propagating the error estimates through a variety of linear operations performed upon the survey data. The following applications are presented to illustrate the adaptability of the theory: the near real-time design of hydrographic surveys utilizing a small scale computer; the design of gravity surveys from which estimates of vertical deflection and geoid undulation may be derived to a specified accuracy; and the design of oceanic sound speed surveys which illustrates the application of the theory to three-dimensional fields. Dissert. Abstr.

N75-24204 Illinois Univ., Urbana.
AN INVESTIGATION OF ODD NITROGEN IN THE IONOSPHERIC E REGION Ph.D. Thesis
Nasser Golshan 1974 215 p
Avail: Univ. Microfilms Order No. 75-11689

Measured electron density and [NO+]/[O2+] data are imposed as constraints on an appropriate model of E region neutral and ion chemistry including the effects of transport and time variations. The ion composition constraint implies a strong dependence of [NO] on soft X-rays leadings to the conclusion that dissociation of [N2] by energetic photoelectrons is a major source of [N(2D).]. Seasonal variations of the thermosphere cause enhanced [NO] in summer in agreement with the summer enhancement of experimental [NO+]/[O2+]. Variations of [N(2S)], [N(2D)] and [NO] with altitude, solar zenith angle, season and solar activity are determined theoretically. The [N(4S)]/[NO] ratio is very sensitive to the absorbed soft X-ray flux and thermospheric composition and temperatyre. The diurnal variations of [N(2S)] and [NO] depend strongly on the [N(4S)]/[NO] ratio in the afternoon. Dissert. Abstr.

N75-24205 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE EFFECTS OF FIELD ALIGNED IONIZATION MODELS ON THE ELECTRON DENSITIES AND TOTAL FLUX TUBES CONTENTS DEDUCED BY THE METHOD OF WHISTLER ANALYSIS
M. Roth 1974 23 p refs Presented at the 2nd Meeting of the European Geophys. Soc. on Phys. of the Plasmapause, Trieste, Italy, 23-26 Sep. 1974 Submitted for publication
(Aeronomica-Acta-A-139-1974) Avail: Issuing Activity

The total electron content of flux tubes, and the electron densities in the equatorial plane and at the altitude of 1000 km are calculated for different types of electron distributions (i.e. diffusive equilibrium, constant density model, gyro-frequency model, and exospheric models with and without angular rotation). The results for these different models are compared with those obtained when an empirical model for the electron density distribution along a geomagnetic field line is used in the interpretation of whistler observations. It is shown that the inferred values of the equatorial densities are not so sensitive to the choice of the model as the electron density at 1000 km altitude where satellite observations are available. This result may be useful for the analysis of a whistler whose propagation path cannot be experimentally specified as being either definitely inside or definitely outside the plasmapause. Results deduced from a given whistler observation with exospheric models are in good agreement with those deduced from the empirical model and provide a support for the validity of the kinetic theory of ion-exospheres. Author (ESRO)

N75-24206* Centre de Recherches sur les Problemes de Pollution, Lagor (France).
REFRACTOMETRIC MEASUREMENTS IN THE LACQ AREA Final Report [MESURES REFRACTOMETRIQUES DANS LE SITE DE LACQ]
J. Molenat and J. Leray 31 Dec. 1973 54 p refs In FRENCH
(Contract DGRST-69-01-893)
Avail: NTIS HC $4.25

Measurements from an X-band refractometer were used to study air refractivity variations in the 1 to 10 meter range above ground in the Lacq area. Rapid gradient variations of the air refraction index were observed and related to turbulent and convection flows in the air. The method is applicable to the forecasting of appearance and disappearance of fog and high risk situations for atmospheric pollution. ESRO

N75-24207 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

HEOS 2 PLASMA OBSERVATIONS IN THE DISTANT POLAR MAGNETOSPHERE: THE PLASMA MANTLE
H. Rosenbauer, H. Gruenwaldt, M. D. Montgomery, G. Paschmann, and N. Schopke Jan. 1975 52 p refs Submitted for publication
(Grant WRK-210)
(MPI-PAE/Extraterr-108) Avail: Issuing Activity

Plasma measurements carried out onboard the HEOS 2 satellite have provided the first systematic description of plasmas in the distant polar magnetosphere. The plasma experiment consists of an instrument for measurement of the three-dimensional velocity distribution function of solar wind ions, and another for measurements of ions and electrons in the magneto-sheath and the magnetosphere. The observations revealed the presence of a persistent layer of tailward flowing magneto-sheath-like plasma inside and adjacent to the magnetopause. This region is termed the plasma mantle. The features of this mantle are described. It is concluded that the most probable cause for the formation of the mantle is the dayside merging of terrestrial and interplanetary field lines. ESRO

N75-24208*# Denver Univ., Colo. Dept. of Physics and Astronomy.
A STUDY OF GEOMAGNETIC STORMS Final Report, Oct. 1973 - Apr. 1975
V. L. Patel Apr. 1975 4 p refs
(Grant NGR-06-004-123)
(NASA-CR-142800) Avail: NTIS HC $3.25 CSCL 08N

Twenty-one geomagnetic storm events during 1966 and 1970 were studied by using simultaneous interplanetary magnetic field and plasma parameters. Explorer 33 and 35 field and plasma data were analyzed on large-scale (hourly) and small-scale (3 min.) during the time interval coincident with initial phase of the geomagnetic storms. The solar-ecliptic Bz component turns southward at the end of the initial phase, thus triggering the main phase decrease in Dst geomagnetic field. When the Bz is already negative, its value becomes further negative. The By component also shows large fluctuations along with Bz. When there are no clear changes in the Bz component, the By shows abrupt changes at the main phase onet. On the small-scale behavior of the magnetic field and electric field ($E = -VxB$) studied in details for the three events, it is found that the field fluctuations in By, Bz and Ey and Ez are present in the initial phase. These fluctuations become larger just before the main phase of the storm begins. In the largescale behavior field remains quiet because the small scale variations are averaged out. Author

N75-24209*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ELECTRON PRECIPITATION IN THE POST MIDNIGHT SECTOR OF THE AURORAL ZONES
L. A. Frank, N. A. Saflekos, and K. L. Ackerson Apr. 1975 53 p refs
(Contracts NAS5-10625; NAS1-8141; NAS1-2973; Grant NGL-16-001-002; Contract N00014-68-A-0196-0009)
(NASA-CR-142812; U-of-Iowa-75-17) Avail: NTIS HC $4.25 CSCL 04A

Comprehensive measurements of the angular distributions and energy spectra of electron intensities with electrostatic analyzer arrays on board the low-altitude satellite Injun 5 are reported. These are for the post-midnight sector of the auroral zones during the high-intensity events accompanying magnetic substorms. Precipitation features on closed terrestrial field lines well equatorward of the trapping boundary for energetic electrons with E greater than 45 keV were examined. No evidences of maxima in the differential energy spectra or of strongly field-aligned currents which are indicative of quasi-static electric fields aligned parallel to the geomagnetic field were found. Precipitation of low-energy electron intensities fluctuated on time scales greater than 2 seconds as viewed at the satellite position. This precipitation was characterized by isotropy for all pitch angles outside the atmospheric backscatter cone. Author

N75-24210*# Pennsylvania State Univ., University Park. Ionospheric Research Lab.
IONOSPHERIC RESEARCH Semiannual Status Report, 1 Oct 1974 - 31 Mar. 1975
31 Mar. 1975 48 p refs
(Contract NAS6-2602; Grants NGR-39-009-032; NGR-39-009-218; NGL-39-009-003; NGL-39-009-002; Contract N00014-67-A-0385-0014; Grants NSF GR-41854; NSF GA-33446X2; DAHC04-75-G-0031)
(NASA-CR-142830; SASR-1; PSU-IRL-SAR-75/1) Avail: NTIS HC $3.75 CSCL 04A

Progress is reported in the following areas: D-region theory; E and F-region; wave propagation; mass spectrometer measurements; and atmospheric reactions. Various supporting operations are included: design and construction of instrumentation; and programming. J.M.S.

N75-24211*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CATALOG OF PARTICLES AND FIELDS DATA 1958 - 1965
Margaret L. King, ed. Jun. 1975 142 p refs
(NASA-TM-X-72574; NSSDC-75-02) Avail: NTIS HC $5.75 CSCL 04A

Available particles and fields data, covering the period 1966 to 1973 inclusive, are announced. Most data result from individual experiments carried on board individual spacecraft. A variety of user-oriented data are included. A newly created composite interplanetary magnetic field data set is discussed and other data products, that may interest the particles/fields community are mentioned, including geomagnetism, magnetopause and bow shock positions, and magnetospherically trapped particles. Author

N75-24212*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CATALOG OF PARTICLES AND FIELDS DATA 1966-1973
Margret L. King, ed. Jun. 1975 202 p
(NASA-TM-X-72575; NSSDC-75-03) Avail: NTIS HC $7.25 CSCL 04A

For abstract, see N75-24211.

N75-24213# Sandia Labs., Albuquerque, N.Mex.
UNMANNED SEISMOLOGICAL OBSERVATORY: SEISMOMETERS AND SIGNAL PROCESSING Final Report
S. D. Stearns and H. B. Durham Dec. 1974 63 p refs Sponsored by ERDA
(SAND-74-0205) Avail: NTIS HC $4.25

Specifications and design criteria are given for the unmanned seismological observatory signal-processing sections. These include the seismometers, analog signal processing equipment, analog-to-digital converters, and digital filters. The results of a literature study of the earth's seismic background are also included. Author (NSA)

N75-24214# Kiruna Geophysical Observatory (Sweden).
KIRUNA GEOPHYSICAL DATA Data Summary, Jul. - Sep. 1974
G. Gustafsson, ed. Sep. 1974 65 p
(Rept-74/7-9) Avail: NTIS HC $4.25

The data obtained from ground measurements relate to polar upper atmospheric conditions and include measurements of geomagnetism, optical aurora, ionospheric ionization, radio wave propagation, and cosmic radiation. ESRO

N75-24215# Kiruna Geophysical Observatory (Sweden).
KIRUNA GEOPHYSICAL DATA Data Summary, Oct. - Dec. 1974
G. Gustafsson, ed. Dec. 1974 69 p
(Rept-74/10-12) Avail: NTIS HC $4.25

For abstract, see N75-24214.

N75-24216# General Electric Co., Santa Barbara, Calif.
REACTION RATE DATA. NUMBER 48: ANNUAL SUMMARY OF PROGRESS IN FY 1974 DNA REACTION RATE PROGRAM
Sep. 1974 27 p refs
(Contract DNA001-74-C-0014)
(AD-A006574) Avail: NTIS CSCL 07/4

Summaries of research on atmospheric reaction kinetics are presented. Topics concern upper atmosphere chemistry, atomic, molecular, and ionic reactions, and reactions related to nuclear fireball studies. GRA

N75-24217# Naval Postgraduate School, Monterey, Calif.
ESTIMATION OF MIXING RATIO PROFILES OVER MARITIME AREAS BY LINEAR REGRESSION METHODS M.S. Thesis
Ralph Jeffrey Ladouce Mar. 1975 75 p refs
(AD-A007654) Avail: NTIS CSCL 04/1

An investigation is made into the feasibility of using mixing-ratio predictions employing multiple linear regression techniques applied to saturated mixing ratio profiles at specified levels. Three such sets of coefficients are determined from Ocean Station Vessel sounding data recorded for the months of January (1967-70, inclusive), and tested for effectiveness to determine a best prediction scheme. The resultant best set of coefficients is then compared to a previously designed regression-prediction scheme due to Weinreb and Crosby (1973) based on a selection of island and coastal data divided equally in time and space. Tests were performed to determine possible sources of error affecting the water vapor specifications made by the multiple regression procedure. GRA

N75-24218# Aerospace Corp., Los Angeles, Calif. Chemistry and Physics Lab.
ATMOSPHERIC PHENOMENA Final Report, 1 Jul. 1973 - 30 Jun. 1972
D. C. Cartwright, N. W. Winter, and N. A. Fiamengo 30 Jun. 1974 116 p refs
(Contract F04701-72-C-0073)
(AD-A007792) Avail: NTIS

The aim of this research is to provide a better understanding of processes taking place in normal and disturbed atmospheres. The Meinel band system of N2(+), which is one of the strongest emissions in normal auroras, has been investigated in order to predict its intensity and altitude profile under auroral conditions. Accurate generalized valence bond calculations (GVB) have been carried out on the ground state of the nitrogen molecule for internuclear distances from 0.80 to 5.00A. For comparative purposes, corresponding Hartree-Fock (HF) and valence bond calculations are also reported. The GVB orbitals were used to construct additional configurations for use in configuration interaction (CI) calculations. Detailed CI calculations have been carried out on all doublet electronic states of N2(+) which can be formed from the first six ionic dissociation limits. Research has also been initiated on the formation of various triatomic molecules as a result of the deposition of energy into the atmosphere. In particular the photochemistry and radiative properties of various NOx compounds is under investigation. Improbed virtual orbital (IVO), HF and CI calculations have been carried out for the 16 excited states of H2O that can be formed by excitation from the two highest occupied orbitals of the ground state into a 3s or 3p Rydberg orbital. GRA

N75-24219# Israel Program for Scientific Translations, Ltd., Jerusalem.
SEISMIC PROPERTIES OF THE MOHOROVICIC DISCONTINUITY
N. I. Davydova, ed. 1975 142 p refs Transl. into ENGLISH of the monograph "Seismicheskie Svoistva Granitsy Mokhorovichicha" Moscow, Izdatelstvo Nauka, 1972 Sponsored by US-Israel Binatl. Sci. Found. and NSF
(TT-74-50029; ISBN-0-7065-1493-9) Avail: NTIS HC $5.75 CSCL 08K

The use of the deep seismic sounding (DSS) technique in studying properties of deep-seated seismic interfaces is discussed along with the frequency spectrum of waves generated at the M discontinuity. Properties of deep-seated seismic boundaries in western Uzbekistan and characteristic features of waves from the Mohorovicic discontinuity in the ocean and the transition zone are also described. Other topics included are: DSS studies of deep faults; earth's crust and upper mantle in the zone near eastern Kamchatka; experience in recording shear and converted waves produced at intracrustal interfaces; absolute levels of seismic wave amplitudes in the 1 to 50 Hz frequency range; and use of dynamic features of seismic waves for characterizing crustal models. GRA

N75-24220# Israel Program for Scientific Translations, Ltd., Jerusalem.
SEISMIC WAVES
E. F. Savarenskii 1975 287 p refs Transl. into ENGLISH of the monograph "Seismicheskie Volny" Moscow, Izdatelstvo Nedra, 1972 Sponsored by US-Israel Binatl. Sci. Found. and NSF
(TT-74-50021; ISBN-0-7065-1500-5) Avail: NTIS HC $8.75 CSCL 08K

Harmonic oscillations, Fourier integral, variation of functions and spectral densities, energy of oscillations, relation between stress and strain, generation and propagation of plane longitudinal and transverse waves, energy of a plane wave and its absorption by the medium, plane waves in halfspaces, and seismic surface waves in a layer are discussed. GRA

N75-24221# National Oceanic and Atmospheric Administration, Boulder, Colo.
AURORAL ELECTROJECT MAGNETIC ACTIVITY INDICES AE(10) FOR 1966
Joe Haskell Allen, Carl C. Abston, and Leslie D. Morris Dec. 1974 149 p refs
(COM-74-50276/37; UAG-37; NOAA-75010801) Avail: NTIS MF $2.25; HC Avail. from Natl. Climatic Center, Federal Bldg., Asheville, N. C. 28801, Attn: Publications. $25.20/year, $0.75/copy CSCL 04A

The auroral electrojet index (AE) is discussed, and a brief description is given of the derivation of 10-station 2.5-min AE indices for 1966. Tables are given of hourly average indices for each day of the year, the stations making the main contribution to the hourly indices, and of the average monthly quiet-time level of horizontal fields (H) at each magnetic observatory. Graphs of the index variations are included for each day of 1966. GRA

N75-24222# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
A SEMI-AUTOMATED SYSTEM FOR THE TRUE-HEIGHT ANALYSIS OF FILM IONOGRAMS. PART 2: CONVERTING FROM HAND TO MACHINE METHODS
G. Goe (EPA, Research Triangle Park, N. C.), G. M. Lerfald (EPA, Research Triangle Park, N. C.), and R. B. Jurgens (EPA, Research Triangle Park, N. C.) Oct. 1974 33 p refs
(COM-75-10217/8; NOAA-TM-ERL-SEL-37-Pt-2; NOAA-75012406) Avail: NTIS HC $3.75 CSCL 04A

An analysis system that automates many of the steps required to obtain electron density versus true height profiles from film ionogram data was developed and used. The semi-automated system retains the judgement and pattern recognition capabilities of trained operators to select and identify the ionogram features of interest when the digitizing is done directly from a projected film image. When hand tracings are prepared in advance, the system can be used in a fully automatic mode. Automatic data processing techniques perform essentially all other functions. GRA

N75-24223# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.
STRONG MOTION EARTHQUAKE ACCELEROGRAMS DIGITIZED AND PLOTTED DATA. VOLUME 1: UNCORRECTED ACCELEROGRAMS, PART R: ACCELEROGRAMS IR244 THROUGH IR254. ACCELEROGRAMS FROM THE SAN FERNANDO, CALIFORNIA EARTHQUAKE OF 1971
A. G. Brady and D. E. Hudson Jul. 1974 302 p refs
(Grant NSF GI-28098)
(PB-239585/3; EERL-73-23) Avail: NTIS HC $9.25 CSCL 08K

The first set of 20 uncorrected digitized earthquake accelerograms was published in July 1969 as Volume 1, Part A, of the present series. This issue continues the San Fernando accelerograms and contains eleven records consisting of one from the building at 6430 Sunset Boulevard in Los Angeles, and two each from the following locations: 222 Figueroa Street, 6464 Sunset Boulevard, 1900 Avenue of the Stars, 234 Figueroa Street, and 533 S. Fremont Avenue in Los Angeles. GRA

N75-24224# California Inst. of Tech., Pasadena. Earthquakes Engineering Research Lab.
STRONG MOTION EARTHQUAKE ACCELEROGRAMS DIGITIZED AND PLOTTED DATA. VOLUME 2: CORRECTED ACCELEROGRAMS AND INTEGRATED GROUND VELOCITY AND DISPLACEMENT CURVES. PARTS O AND P:

ACCELEROGRAMS IIO198 TO IIO201, IIO204 TO IIO208, IIO210, IIO213, IIP214 TO IIP223, AND IIP232
M. D. Trifunac, A. G. Brady, and D. E. Hudson Jun. 1974 308 p refs
(Grant NSF GI-28098)
(PB-239586/1; EERL-74-55) Avail: NTIS HC $9.25 CSCL 08K

Accelerograms obtained during the San Fernando earthquake of Feb. 9, 1971 are presented along with records as indicated: 1625 Olympic (3), 4867 Sunset (3), 3345 Wilshire (3), 9841 Airport (2), Griffith Park (1) in L.A.; Utilities Bldg. (1), Terminal Is. (1), in Long Beach; Hall of Records in San Bernardino, the Fairmont Reservoir, U.C. Santa Barbara, Hemet, 1215 Gallery at Hoover Dam, 666 W. 19th in Costa Mesa, Santa Anita Reservoir, Port Hueneme, and Puddingstone Reservoir. GRA

N75-24225# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.
STRONG MOTION EARTHQUAKE ACCELEROGRAMS DIGITIZED AND PLOTTED DATA. VOLUME 2: CORRECTED ACCELEROGRAMS AND INTEGRATED GROUND VELOCITY AND DISPLACEMENT CURVES. PART Q AND R: ACCELEROGRAMS IIQ233 TO IIQ243 AND IIR244 TO IIR254
M. D. Trifunac, A. G. Brady, and D. E. Hudson Jun. 1974 285 p refs
(Grant NSF GI-28098)
(PB-239587/9; EERL-74-56-Vol-2) Avail: NTIS HC $8.75 CSCL 08K

This issue contains the accelerograms obtained during the San Fernando earthquake of Feb. 9, 1971, and includes three records each from the buildings at 14724 Ventura Blvd. and 800 W. First St. in Los Angeles and 1760 N. Orchid Ave. in Hollywood; 2 records from the buildings at 222 Figueroa St., 6464 Sunset Blvd., 1900 Avenue of the Stars, 234 Figueroa St., and 533 S. Fremont in Los Angeles and 9100 Wilshire Blvd. in Beverly Hills; and 1 record from the building at 6430 Sunset Blvd. in Los Angeles. GRA

N75-24267* Scientific Translation Service, Santa Barbara, Calif.
SOLAR ACTIVITY AND THE MOTIONS OF THE UPPER ATMOSPHERE
A. A. Dmitriyev and M. S. Shurova *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 17-21 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 19-23 (For availability see N75-24262 15-48)
CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-24226 Michigan Univ., Ann Arbor.
EVALUATION OF PROBABILITY FORECASTS IN METEOROLOGY Ph.D. Thesis
Allan Hunt Murphy 1974 284 p
Avail: Univ. Microfilms Order No. 75-10242

A framework for the evaluation of probability forecasts is described and the nature and properties of the measures associated with this framework are investigated. The evaluation process is described, with particular reference to the purposes for evaluation. Two forms of evaluation are identified, empirical (or inferential) evaluation and operational (or decision-theoretic). Desirable attributes of probability forecasts from normative and substantive viewpoints are identified and described. The normative attributes indicate the need for proper measures. The principal substantive attributes are validity and utility. Frameworks for empirical and operational evaluation are described in algebraic and geometric terms. The framework for operational evaluation, which is based in part upon a modified version of the subjective, expected-utility model for decision making, is shown to be a comprehensive framework for evaluation. Dissert. Abstr.

N75-24227 Arizona Univ., Tucson.
A STOCHASTIC SNOW MODEL Ph.D. Thesis
Lawrence Ernest Cary 1974 147 p
Avail: Univ. Microfilms Order No. 75-11060

The purpose of this study was to develop a stochastic model of the snowfall, snow accumulation and ablation process. Snow storms occurring in a fixed interval were assumed to be a homogeneous Poisson process with intensity lambda. The snow storm magnitudes were assumed to be independent and identically distributed random variables. The magnitudes were independent of the number of storms and concentrated at the storm termination epochs. The snow water equivalent from all storms was a compound Poisson process. In the model, storms then occurred as positive jumps whose magnitudes equaled the storm amounts. Between storms, the snowpack ablated at a constant rate. Random variables characterizing this process were defined. The time to the occurrence of the first snowpack, generated by the first storm, was a random variable, the first snow-free period. The snowpack lasted for a random duration, the first snowpack duration. Dissert. Abstr.

N75-24228*# Oklahoma Univ., Norman. Atmospheric Research Lab.
VARIATIONAL OPTIMIZATION ANALYSIS OF TEMPERATURE AND MOISTURE ADVECTION IN A SEVERE STORM ENVIRONMENT
Marshall J. McFarland May 1975 95 p refs
(Contract NAS9-13360)
(NASA-CR-141794; WEAT-16) Avail: NTIS HC $4.75 CSCL 04B

Horizontal wind components, potential temperature, and mixing ratio fields associated with a severe storm environment in the south central U.S. were analyzed from synoptic upper air observations with a nonhomogeneous, anisotropic weighting function. Each data field was filtered with variational optimization analysis techniques. Variational optimization analysis was also performed on the vertical motion field and was used to produce advective forecasts of the potential temperature and mixing ratio fields. Results show that the dry intrusion is characterized by warm air, the advection of which produces a well-defined upward motion pattern. A corresponding downward motion pattern comprising a deep vertical circulation in the warm air sector of the low pressure system was detected. The axes alignment of maximum dry and warm advection with the axis of the tornado-producing squall line also resulted. Author

N75-24229# Mitre Corp., McLean, Va.
AVIATION: AUTOMATIC WEATHER OBSERVING SYSTEM (AV-AWOS) PRELIMINARY SYSTEM DESCRIPTION Final Report
C. G. Teschner Jan. 1975 18 p
(Contract DOT-FA69NS-162)
(AD-A007697; MTR-6831; FAA-RD-75-5) Avail: NTIS HC $3.25 CSCL 04B

The aviation automatic weather observation system (AV-AWOS) preliminary system description is a summarization of the descriptive material contained in the FAA Engineering Requirement, FAA-ER-450-015 and the NWS AV-AWOS Development Plan supplemented by information from NWS with respect to their on-going development work. At this point in the development cycle, there are a number of areas that require further definition for guidance to the development activities. These areas are identified by a list of questions in Appendix A. The description can be updated as these questions are answered and as development progresses until it ultimately describes the operational AV-AWOS to be deployed in the field. Author

N75-24230*# Scientific Translation Service, Santa Barbara, Calif.
FRENCH PARTICIPATION IN THE EXAMETNET PROGRAM OPERATIONAL IMPLEMENTATION
J. Latour and B. Loitiere Washington NASA Jun. 1975 21 p Transl. into ENGLISH from proceedings of Intern. Astronautical Federation, 25th Intern. Astronautical Congr. (Amsterdam), 30 Sep. - 5 Oct. 1974 20 p
(Contract NASw-2483)
(NASA-TT-F-16388) Avail: NTIS HC $3.25 CSCL 22B

The EXAMETNET program is presented. The purpose of the program is the determination of temperature and wind profiles

in the atmosphere between 20 and 80 km along the 60 W meridian. A description of the French participation is given. Included are estimates of the reliability of the equipment and of the accuracy of the measurements. Author

N75-24231*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WEATHER SATELLITE PICTURE RECEIVING STATIONS, APT DIGITAL SCAN CONVERTER
Charles H. Vermillion and John C. Kamowski Washington May 1975 105 p refs
(NASA-TN-D-7994; G-7523) Avail: NTIS HC $5.25 CSCL 04B

The automatic picture transmission digital scan converter is used at ground stations to convert signals received from scanning radiometers to data compatible with ground equipment designed to receive signals from vidicons aboard operational meteorological satellites. Information necessary to understand the circuit theory, functional operation, general construction and calibration of the converter is provided. Brief and detailed descriptions of each of the individual circuits are included, accompanied by a schematic diagram contained at the end of each circuit description. Listings of integral parts and testing equipment required as well as an overall wiring diagram are included. This unit will enable the user to readily accept and process weather photographs from the operational meteorological satellites. Author

N75-24232*# Texas A&M Univ., College Station. Center for Applied Geosciences.
RELATIONSHIPS BETWEEN MOTION ON ISENTROPIC SURFACES FROM 3-H RAWINSONDE DATA AND RADAR ECHOES
James W. Overall and James R. Scoggins Washington NASA May 1975 68 p refs
(NAS8-26751)
(NASA-CR-2558; M-143) Avail: NTIS HC $4.25 CSCL 04B

Vertical motion in insentropic surfaces obtained at 3-h intervals conducted on 11 and 12 May, 1974 is related to convection indicated by radar echoes. Temporal and spatial changes in vertical motion are shown and demonstrated to be associated with areas of convection. Large vertical motion was calculated, and it is shown that vertical motion changes as much as 20 cm s (-1) in a horizontal distance of 300 km. The rate of change of vertical motion is demonstrated to be as large a 8 cm s (-1)h(-1) from data taken at 3-h intervals, while data taken at 12-h intervals the same day displayed a maximum rate of change of 2 cm s(-1)n(-1). Radar observations confirmed that the intensity of convection varies as a result of the atmospheric variability as detected by 3-h data but is invisible in data taken at 12-h intervals. Author

N75-24233*# Texas A&M Univ., College Station. Center for Applied Geosciences.
CLOUD MOTION IN RELATION TO THE AMBIENT WIND FIELD Final Report
Henry E. Fuelberg and James R. Scoggins Washington NASA May 1975 37 p refs
(Contract NAS8-26751)
(NASA-CR-2557) Avail: NTIS HC $3.75 CSCL 04B

Trajectories of convective clouds were computed from a mathematical model and compared with trajectories observed by radar. The ambient wind field was determined from the AVE IIP data. The model includes gradient, coriolis, drag, lift, and lateral forces. The results show that rotational effects may account for large differences between the computed and observed trajectories and that convective clouds may move 10 to 20 degrees to the right or left of the average wind vector and at speeds 5 to 10 m/sec faster or slower than the average ambient wind speed. Author

N75-24234# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH: SEVENTH STATUS REPORT ON IMPLEMENTATION
1974 110 p
(WMO-401; ISBN-92-63-10401-8) Avail: NTIS HC $5.25; WMO, Geneva

A summary statement on the World Weather Watch plan and implementation program from 1972 to 1975 for the Global Observing Service, the Global Telecommunication System, and the Global Data Processing System are given, and improvements which may be expected in the years to come are indicated. Expected development, during the period 1976 to 1979, of relevant components of the World Weather Watch is also discussed. ESRO

N75-24235# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS CARIBBEAN AND NEARBY ISLAND COASTAL MARINE AREAS. VOLUME 2: AREA 7 - CAYMAN, AREA 8 - JAMAICA WEST, AREA 9 - JAMAICA SOUTH, AREA 10 - JAMAICA NORTH, AREA 11 - JAMAICA SOUTH-EAST
Nov. 1974 406 p
(AD-A001031) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSD Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N75-24236# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS CARIBBEAN AND NEAR BY ISLAND COASTAL MARINE AREAS. VOLUME 4: AREAS 18 - HISPANIOLA NORTH, AREA 19 - SANTO DOMINGO, AREA 20 - MONA PASSAGE, AREA 21 - PUERTO RICO SOUTH, AREA 22 - PUERTO RICO NORTH, AREA 23 - VIEQUES
Nov. 1974 485 p
(AD-A001457) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSD Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N75-24237# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. NORTH AMERICAN COASTAL MARINE AREAS, REVISED. ATLANTIC AND GULF COASTS. VOLUME 1. REVISED. AREA 1: BELLE ISLE STRAIT. AREA 2: OSV BRAVO. AREA 3: NE NEWFOUNDLAND COAST. AREA 4: SE NEWFOUNDLAND COAST. AREA 5: PLACENTIA BAY SOUTH. AREA 6: CABOT STRAIT. AREA 7: ANTICOSTI ISLAND
May 1975 563 p
(AD-A006990) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSD Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N75-24238# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
A STOCHASTIC RAINFALL MODEL AND STATISTICAL ANALYSIS OF HYDROLOGIC FACTORS Final Report, Apr. 1973 - Sep. 1974
Ross B. Corotis Dec. 1974 188 p refs
(Grant NSF GK-37442)
(PB-238948/4; NUCE-ST-74-15) Avail: NTIS HC $7.00 CSCL 08H

The observed behavior of thunderstorm-type activity is used to formulate a multidimensional stochastic model for runoff-producing rainfall and is used to describe the thunderstorm process, and probability distributions are assigned to all random variables. Several different theoretical aspects associated with rainfall and runoff are discussed. A somewhat simplified thunderstorm model is used to derive a probability distribution for instantaneous rainfall, and several statistical relations are

considered. The effect of urbanization on both rainfall and runoff is discussed along with a statistical regression analysis relating flood damage to characteristics of the watershed basin, precipitation data, and streamflow data. GRA

N75-24239# National Weather Service, Silver Spring, Md.
OPERATIONS OF THE NATIONAL WEATHER SERVICE, 1974
Nov. 1974 255 p
(COM-75-10194/9; NOAA-75012108) Avail: NTIS HC $8.50

The meteorological, hydrological, and oceanographic operations of the National Weather Service are summarized. Meteorological program activities, the hydrologic forecast and service activities, as well as the oceanographic and climatological services are included. The research and development, engineering, and technical training areas are described. Appendices including a listing of stations with identifiers and a tabular summary of facilities and service programs at each station are presented. GRA

N75-24240# National Severe Storms Lab., Norman, Okla.
UPDRAFT PROPERTIES DEDUCED FROM RAWINSOUNDINGS
Robert P. Davies-Jones and James H. Henderson Nov. 1974 128 p
(COM-75-10193/1; NOAA-TM-ERL-NSSL-72;
NOAA-75012201) Avail: NTIS HC $5.75 CSCL 04B

National Severe Storms Laboratory mesonetwork soundings were taken near thunderstorms and squall lines. These soundings sampled updrafts at various levels. The updrafts were associated with moderate thunderstorms that formed in baroclinic regions with maritime tropical air near the surface overlaid by dryer air aloft. The updrafts were generally located in regions of strong radar reflectivity gradient at 0 degree antenna tilt. The updraft soundings often showed pseudo-adiabatic lapse rates immediately above the updraft condensation level. Statistical analysis of the data confirms that updrafts are warm core at mid- and upper-levels and that they are relatively cool at low levels (below 700 mb). Important effects of perturbation pressure gradient forces are emphasized. GRA

N75-24241# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
THE ANCHORAGE, ALASKA, REAL TIME AURORAL RADAR MONITOR: SYSTEM DESCRIPTION AND SOME PRELIMINARY ANALYSES
Alvin M. Gary and Warner L. Ecklund Sep. 1974 43 p refs
(COM-75-50114/8; NOAA-TR-ERL-306-AL-9;
NOAA-74122606) Avail: NTIS MF $2.25; SOD HC as C55.13:ERL-306-AL-9 CSCL 04A

A description is given of the 50-MHz auroral radar at Anchorage, Alaska as well as of the system that reduces and communicates the radar data in real time to the Space Environment Services Center in Boulder, Colo., and to the Air Weather Service at Offutt Air Force Base (AFB) in Omaha, Nebr. The radar data format and examples of real-time messages received in Boulder and Omaha during auroral radar events are discussed. The real time radar data are compared with magnetometer data and satellite auroral photographs to demonstrate the radar response to different types and levels of magnetospheric activity. GRA

N75-24242# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. INDONESIAN COASTAL MARINE AREAS, VOLUME 1. AREA 1: SOUTHEAST SUMATRA. AREA 2: CHRISTMAS ISLAND. AREA 3: SUNDA STRAIT. AREA 4: NORTHEAST JAVA SEA. AREA 5: BANGKA ISLAND NORTHEAST. AREA 6: NATUNA ISLAND. AREA 7: SARAWAK
Apr. 1975 564 p
(AD-A006923) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSD Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N75-24243# National Weather Service, Silver Spring, Md. Office of Hydrology.
RIVER FORECASTS PROVIDED BY THE NATIONAL WEATHER SERVICE. VOLUME 2: 1973
1974 68 p
(COM-75-50005/8; NOAA-74111806) Avail: NTIS MF $2.25; Avail: HC $0.75 from National Climatic Center, Asheville, N. C. 22801 CSCL 08H

River forecasts and warnings, as well as other National Weather Service hydrologic services are described. Information is given on: hydrologic operations, forecasts and services, river forecast centers, NWS field offices and other hydrologic services, data acquisition networks; flash flood warning program, water supply forecasting program, river forecast center addresses, river forecast points and miscellaneous information, highest stages in National Weather Service gages, and record high stages prior to gage records. Indexes are arranged by states, stations, and by rivers. A list of water supply forecast points is included. GRA

N75-24244# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: CARIBBEAN AND NEARBY ISLAND COASTAL MARINE AREAS. VOLUME 3: AREA 12, HISPANIOLA SOUTH; AREA 13, WINDWARD PASSAGE; AREA 14, GRAND BAHAMA; AREA 15, NASSAU; AREA 16, SAN SALVADOR; AREA 17, ACKLINS ISLAND
Nov. 1974 489 p
(AD-A001912) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSD Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. GRA

N75-24245# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: CARIBBEAN AND NEARBY ISLAND COASTAL MARINE AREAS. VOLUME 5: AREA 24, VIRGIN ISLANDS; AREA 25, LEEWARD ISLANDS; AREA 26, WINWARD ISLANDS; AREA 27, TRINIDAD; AREA 28, BARCELONA; AREA 29, CARACAS
Nov. 1974 487 p
(AD-A001918) Avail: NTIS CSCL 04/2
For abstract, see N75-24244.

N75-24246# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS: CARIBBEAN AND NEARBY ISLAND COASTAL MARINE AREAS. VOLUME 6: AREA 30, GULF OF VENEZUELA, AREA 31, RIOHACHA; AREA 32, CARTAGENA; AREA 33, COLON; AREA 34, GULF OF PANAMA; AREA 35, GALAPAGOS ISLANDS
Nov. 1974 485 p
(AD-A001973) Avail: NTIS CSCL 04/2
For abstract, see N75-24244.

N75-24247# Systems Science and Software, La Jolla, Calif.
EFFECTS OF MESO-SCALE AND SMALL SCALE INTERACTIONS ON GLOBAL CLIMATE. VOLUME 1: OROGRAPHIC EFFECTS ON GLOBAL CLIMATE Final Report, 1 Nov. 1973 - 31 Dec. 1974
John Schaibly 28 Feb. 1975 360 p refs
(Contract F44620-74-C-0035; ARPA Order 2609)
(AD-A007034; SSS-R-75-2556-Vol-1;
AFOSR-75-0397TR-Vol-1) Avail: NTIS CSCL 04/2

The report summarizes the three-year research program at Systems, Science and Software to investigate the effects of meso-scale and small-scale interactions on global climate. The research concentrated on two areas, orographic effects on the wind patterns and effects of radiation transport on the climate. Volume I describes the orographic research and includes the theory of momentum transport due to mountain ranges, the formulation of several computer codes to calculate the effects

for realistic topography and wind profiles, and the application of these codes to various problems and comparison with other calculations as well as experimental results. GRA

N75-24248# Systems Science and Software, La Jolla, Calif.
MESO-SCALE AND SMALL-SCALE INTERACTIONS ON GLOBAL CLIMATE. VOLUME 2: RADIATION TRANSPORT EFFECTS ON GLOBAL CLIMATE Final Report, 1 Nov. 1973 - 31 Dec. 1974
John Schaibly 28 Feb. 1975 204 p refs
(Contract F44620-74-C-0035; ARPA Order 2609)
(AD-A007035; SSS-R-75-2556-Vol-2;
AFOSR-75-0398TR-Vol-2) Avail: NTIS CSCL 04/2

Radiation transport research which produced a benchmark code against which more simplified models can be compared is described. The code, ATRAD, is characterized by high angular and frequency resolutions and by the ability to calculate radiative atmospheric heating rates taking into account molecular absorption and scattering from arbitrary distributions of aerosols and particulates. GRA

N75-24249# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN ANALYSIS OF IMPERFECTIONS IN DMSP PHOTOGRAPHS CAUSED BY HIGH ENERGY SOLAR AND TRAPPED PROTONS Air Force Surveys in Geophysics
Robert C. Filz and Ludwig Katz 19 Sep. 1974 14 p
(AF Proj. 8600)
(AD-A007679; AFCRL-AFSG-294; AFCRL-TR-74-0469) Avail: NTIS CSCL 04/1

During the passage of the DMSP satellite through the South Atlantic magnetic anomaly, interference blips are observed. This report quantitatively correlates these blips with the high energy trapped proton fluxes. Observations of similar blips are also reported for the August 1972 solar proton event. From correlations with proton fluxes observed by the OV5-6 and 72-1 high energy proton detectors, it is determined that the blips are caused by the passage of individual E greater than or equal to 15 MeV protons through the DMSP sensor. GRA

N75-24250# Israel Program for Scientific Translations, Ltd., Jerusalem.
CLOUD PHYSICS: EXPERIMENTAL INVESTIGATIONS
O. A. Volkovitskii, ed. 1974 126 p refs Transl. into ENGLISH of the book "Eksperimentalnye Issledovaniya po Fizike Oblakov" Moscow, Moskovskoe Otd. Gidrometeoizdata, 1971 Sponsored by NOAA and NSF
(TT-73-50032) Avail: NTIS

Articles are presented on cloud physics. Topics discussed include the study of local inhomogeneities in microphysical properties of fogs in cloud chambers, the aspiration coefficients of aerosol flow, the modification of cloud chamber fogs with condensation nuclei, electrical properties of aerosol chamber media, comparison of the concentrations of cloud condensation nuclei and Aitken nuclei in the free atmosphere, approximate formulas for estimating temperature variations in cloud chambers during pressure reduction, origin of atmospheric aerosols, automation of the processing of fog microstructure measurements, air conductivity measuring instruments, low-speed vane anemometers, errors in photoelectric determination of concentration and size spectrum of aerosol particles, and processing aerosol sample photomicrographs. M.J.S.

N75-24251# RAND Corp., Santa Monica, Calif.
PARAMETERIZATION OF THE PLANETARY BOUNDARY LAYER IN ATMOSPHERIC GENERAL CIRCULATION MODELS, A REVIEW
Chandrakant M. Bhumralkar Mar. 1975 55 p refs
(Contract DAHC15-73-C-0181; ARPA Order 189-1)
(AD-A007579; R-1654-ARPA) Avail: NTIS CSCL 04/2

Numerical general circulation models (GCMs) have been adopted as important tools for understanding the physical basis of climatic changes. These models vary greatly, especially in their treatment of those physical processes that cannot be resolved by the grid spacing of the model, such as boundary-layer processes. These are several approaches to boundary-layer parameterization: Some of these are based on so-called K-theory; others are based on similarity theory. Considering the varying degrees of vertical resolution of general circulation models, determination of the surface fluxes is perhaps the most important aspect of the boundary-layer parameterization in a GCM. At present there is not sufficient evidence to determine which particular boundary-layer parameterization scheme is most satisfactory. It is therefore suggested that a systematic sensitivity test of various schemes be carried out to determine the best approach. GRA

N75-24252# Fleet Numerical Weather Facility, Monterey, Calif.
AUTOMATED LONG RANGE (ANALOG) FORECAST MODEL
Donald R. McConathy, Jr. and Carl D. Thormeyer Dec. 1974 80 p refs
(AD-A007846; TN-74-1) Avail: NTIS CSCL 04/2

Naval forces have two principle requirements for long-range weather forecasts: (1) To protect ships in transit, and (2) to aid in operational planning. Since the state-of-the-art precludes adequate dynamic model forecasts beyond a few days, a synoptic climatology approach has been developed for longer ranges. Additional products include sea condition probabilities, a list of best analog dates, and Terminal Probability Forecasts for selected Naval Installations. Four years of statistical verification have consistently demonstrated skill over persistence beyond two days, with skill over climatology out to six to seven days prior to 1973 and out to eight days or more since then. GRA

N75-24253# Naval Weather Service Detachment, Asheville, N.C.
BERMUDA ENVIRONMENTAL SCENARIO
Nov. 1974 218 p refs
(AD-A007448) Avail: NTIS CSCL 04/2

The environmental study covers the marine area 29-35 deg N, 62-68 deg W as well as land station data for Bermuda. The Bermuda Oceanic Area, as defined in this report spans over 100,000 square nautical miles of ocean broken only by 20 square miles of lowlying island that make up the Bermudas. Monthly Probability contingencies and general purpose graphs for several elements are provided in Part A. Part B contains persistence graphs primarily based upon nearly 25 years of continuous Bermuda land station records. GRA

N75-24254# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN MISSILE NO. 1005, ROUND NO. 645 AML Meteorological Data Report
Dec. 1974 17 p
(DA Proj. 1T6-65702-D-127)
(AD-A007462; DR-875) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John, Missile Number 1005, Round Number 645 AML, are presented in tabular form. GRA

N75-24255# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
ATMOSPHERIC STRUCTURE. PART 3: UPPER AIR AND SURFACE DATA: HOLLOMAN SITE Meteorological Data Report
Marjorie M. Hoidale, Michael P. Dayton, and Lamar Newman Jan. 1975 233 p refs
(DA Proj. 1T6-65702-D-127)
(AD-A007468; DR-877-Pt-3) Avail: NTIS CSCL 04/2

A statistical analysis of surface and upper air rawinsonde data is presented for Holloman Site, White Sands Missile Range, New Mexico. Atmospheric parameters covered for the layer from the surface to 100,000 feet above mean sea level are: Wind, temperature, pressure, density, moisture, index of refraction and freezing level. Upper air climatological information is based on the period of observation from 1961-1973; while surface temperature and precipitation data span 1942-1973, and wind records 1966-1973. GRA

N75-24256# Air Weather Service, Scott AFB, Ill.
DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP): USER'S GUIDE
Lee G. Dickinson, S. Edward Boselly, III, and Walter S. Burgmann Dec. 1974 121 p refs
(AD-A007678; AWS-TR-74-250) Avail: NTIS CSCL 22/2

The capabilities of the spacecraft, sensors, and data processor for the Defense Meteorological Satellite Program are described. Many meteorological and geophysical uses of these data are examined, and examples used to illustrate the capabilities of the system to tailor the imagery for a large variety of present and future users. GRA

N75-24257# National Severe Storms Lab., Norman, Okla.
MESONETWORK ARRAY: ITS EFFECT ON THUNDERSTORM FLOW RESOLUTION
Stanley L. Barnes Oct. 1974 25 p refs
(COM-75-10248/3; NOAA-TM-ERL-NSSL-74; NOAA-75011402) Avail: NTIS HC $3.25 CSCL 04B

The fidelity of thunderstorm surface wind analyses is examined objectively in relation to the pattern and density of observation points. Analyses using all data recorded in a 44-station mesonetwork are compared with analyses based on data from 75, 50 and 25 percent of the stations. Stations are eliminated both randomly and selectively to achieve in one test approximate even spacing and in another test dense observation lines across storm motion. With time-series data (observations at five-min intervals for plus or minus 30 min), it requires only 22 stations to delineate adequately surface flows associated with one multicell and one supercell thunderstorm. Quasi-steady thunderstorm flows can be well depicted by 5 min interval time-series observations at stations 15 km apart on the vortices of equilateral triangles. GRA

N75-24258# National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
COLLECTED REPRINTS: 1971-1972: ATMOSPHERIC PHYSICS AND CHEMISTRY LABORATORY
Jul. 1973 290 p refs
(COM-75-10260/8; NOAA-74020401) Avail: NTIS HC $8.75 CSCL 04B

Forty studies on intentional and inadvertant weather modification are collected in this volume. These suggest that weather modification is progressing rapidly from the purely empirical operation experiment towards a science based on physical principles. GRA

N75-24259# National Meteorological Center, Washington, D.C.
AN EVALUATION OF THE NATIONAL METEOROLOGICAL CENTER'S EXPERIMENTAL BOUNDARY LAYER MODEL
Paul D. Polger Dec. 1974 22 p refs
(COM-75-10267/3; NOAA-TM-NWS-NMC-55; NOAA-75021107) Avail: NTIS HC $3.25 CSCL 04B

For almost a year, the National Meteorological Center experimented with a planetary boundary model. The PBL model has eight levels, surface to 1600 m, and a horizontal grid mesh of 190.5 km over the contiguous United States. Forecasts were based on 0000 G.m.t. data and were run to 24 hours. The parameters forecast by the PBL model include temperature, winds, relative humidity, freezing levels, precipitation type, and severe weather indices. The results show that the PBL model has potential for providing useful forecasts of ceiling/visibility combination, rain vs. snow delineation, and areas of severe weather and temperature changes over the eastern two-thirds of the United States. GRA

N75-24260# National Environmental Satellite Center, Washington, D.C.
SATELLITE INFRARED SOUNDINGS FROM NOAA SPACECRAFT
L. M. McMillin, D. Q. Wark, J. M. Siomkajlo, P. G. Abel, and A. Werbowetzki Sep. 1973 120 p Previously announced as COM-73-50936
(COM-75-10256/6; NOAA-TR-NESS-65; NOAA-73102413) Avail: NTIS HC $5.25 CSCL 04B

Data are currently being received from a vertical temperature profile radiometer (VTPR) aboard the NOAA 2 spacecraft to produce operational atmospheric soundings of temperature and humidity on a global scale. This report describes the VTPR instrument, its calibration, the procedure to obtain clear radiances from cloud-contaminated radiance measurements, retrieval techniques used to obtain temperature and humidity profiles from clear radiances, the quality checks performed on these profiles, and the various forms in which data are available to potential users. GRA

N75-24261# Hawaii Univ., Honolulu. Dept. of Meteorology.
SOME CHARACTERISTICS OF HAWAIIAN HIGH INTENSITY RAINFALL
Charles M. Fullerton and S. K. Wilson Aug. 1974 53 p refs (Contract DI-14-31-0001-3872)
(PB-239398/1; UHMET-74-01; W75-04442; OWRT-B-026-HI(1)) Avail: NTIS HC $4.25 CSCL 04B

A computer monitored network of rapid reponse Raymond-Wilson rainfall intensity gauges was established at the Cloud Physics Observatory (CPO), on the windward coast of the island of Hawaii, to record the passage of both warm and cold showers. These showers are characterized by high intensity rainfall (50 to 300 mm/hr) and an association increase in atmospheric pressure, a change in wind velocity, and a reversal of the electric potential gradient. The showers often occur at night, during the maximum of the diurnal pressure oscillation, and frequently in groups of two to four with an interval of 1000 to 10,000 seconds between separate showers. A relationship between the height of the base of the trade wind inversion and the total amount of rainfall was observed. GRA

N75-24270* Scientific Translation Service, Santa Barbara, Calif.
DETERMINING THE PARAMETERS OF THE PROGNOSTIC OPERATOR FOR UNDAMPED FLUCTUATIONS BY THE USE OF THE D SUB m(KAPPA; ALPHA 1,..., ALPHA SUB m)
A. A. Dmitriyev *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 30-35 ref Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 31-35 (For availability see N75-24262 15-48) CSCL 04B

N75-24271* Scientific Translation Service, Santa Barbara, Calif.
TEMPERATURE FIELDS OF AN ABSORPTIVE MEDIUM IN A RADIATING SYSTEM OF ARBITRARY CONFIGURATION (THE SPATIAL PROBLEM)
Yu. A. Surinov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 36-39 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 36-40 (For availability see N75-24262 15-48) CSCL 04A

N75-24272* Scientific Translation Service, Santa Barbara, Calif.
CALCULATION OF THE RADIATIVE HEAT EXCHANGE IN A CONICAL CAVITY OF COMPLEX CONFIGURATION WITH AN ABSORPTIVE MEDIUM
Yu. A. Surinov and V. E. Fedyanin *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 40-45 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 41-46 (For availability see N75-24262 15-48) CSCL 04A

N75-24274* Scientific Translation Service, Santa Barbara, Calif.
SOME NEW METHODS OF DETERMINING AND STUDYING THE ABSORPTIVITY OF A MEDIUM AND THE GENERALIZED ANGULAR COEFFICIENTS OF RADIATION
Yu. A. Surinov and N. V. Sosnovyy *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 53-56 Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 53-55 (For availability see N75-24262 15-48) CSCL 04A

N75-24278* Scientific Translation Service, Santa Barbara, Calif.
LONG-DISTANCE RECORDING OF THE HUMIDITY OVER THE SEA
V. V. Buklanov and V. M. Klaptsov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 75-80 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 73-77 (For availability see N75-24262 15-48) CSCL 04B

N75-24279* Scientific Translation Service, Santa Barbara, Calif.
PHYSICAL NATURE OF THE CLIMATIC AND BIOLOGICAL EFFECTS OF THE PERU CURRENT

A. M. Gusev *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 81-87 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 78-84 (For availability see N75-24262 15-48)
CSCL 04B

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-24262*# Scientific Translation Service, Santa Barbara, Calif.
PHYSICS OF THE SEA AND ATMOSPHERE
A. A. Dmitriyev, ed. Washington NASA May 1975 104 p refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Moscow, Feb. 1974 p 1-97
(Contract NASw-2483)
(NASA-TT-F-16225) Avail: NTIS HC $5.25 CSCL 08C

The dynamics, thermics, optics, and biophysics of the sea are considered in the frame of air water interactions. For individual titles, see N75-24263 through N75-24281.

N75-24263* Scientific Translation Service, Santa Barbara, Calif.
RECENT CHANGES IN THE OCEAN LEVEL
G. P. Kalinin and R. K. Klige *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 1-4 Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 3-6 (For availability see N75-24262 15-48)
CSCL 08C

Analysis of the oscillations of the yearly average ocean levels, measured around the coasts of the world ocean, establishes a general rise in all observed ocean levels. This recent rise in ocean level is closely related to the general warming of the earth. G.G.

N75-24264* Scientific Translation Service, Santa Barbara, Calif.
COASTAL UPWELLING ON THE EAST OF THE TROPICAL ZONE OF THE NORTH ATLANTIC AND ITS RELATION TO THE STABILITY OF THE NORTHEAST TRADEWIND
A. I. Sorkina *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 5-7 ref Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 7-9 (For availability see N75-24262 15-48)
CSCL 08C

It is shown that the intensities of deep water upwelling phenomena are correlated with seasonal features of the atmospheric circulation. Increased uprising of cold deep water is accompanied by increased stability of the tradewinds; the vertical transfer of cold water grows stronger as the tradewinds become more stable. G.G.

N75-24265* Scientific Translation Service, Santa Barbara, Calif.
DRIFT CURRENT IN A THIN SURFACE LAYER OF THE OCEAN
A. V. Shumilov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 8-12 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 10-14 (For availability see N75-24262 15-48)
CSCL 08C

A theoretical model is proposed for the drift current in the surface layer of the sea that considers molecular transfer exchange in the thermal conductivity coefficient for the thin layers of water and air near the ocean/atmosphere boundary as well as a layer of depth in the sea in which the coefficient rises from the molecular to turbulent values. G.G.

N75-24266* Scientific Translation Service, Santa Barbara, Calif.
THE ROLE OF LARGE-SCALE ATMOSPHERIC CIRCULATION IN THE FORMATION OF TEMPERATURE ANOMALIES IN SURFACE WATERS AS ILLUSTRATED BY THE NORTHERN PART OF THE PACIFIC OCEAN
A. I. Sorkina *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 13-16 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 15-18 (For availability see N75-24262 15-48)
CSCL 08C

One important reason for thermal anomalies in the ocean is the dynamic action of anomalous wind systems that set masses of surface water in motion; predominant longitudinal transport of water and air leads to a significant redistribution of cold and warm waters. Heat exchange between the ocean and atmosphere plays an additional role in the formation of water temperature anomalies. G.G.

N75-24267* Scientific Translation Service, Santa Barbara, Calif.
SOLAR ACTIVITY AND THE MOTIONS OF THE UPPER ATMOSPHERE **c46**
A. A. Dmitriyev and M. S. Shurova *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 17-21 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 19-23 (For availability see N75-24262 15-48)
CSCL 04A

A possible mechanism for the action of solar radiation on the motion of the upper atmosphere is considered that includes the time dependent interplanetary field contour line and its effect on zonal wind velocity. A strong correlation is reported between this induction mechanism and those indices of solar activity that characterize the magnetic fields of the solar plasma. G.G.

N75-24268* Scientific Translation Service, Santa Barbara, Calif.
MICROCONVECTION IN EVAPORATION AND MICROCONVECTION IN ICE FORMATION
A. V. Shumilov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 22-25 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 24-26 (For availability see N75-24262 15-48)
CSCL 08C

Absorption of solar radiation by sea water with contact heat exchange and evaporation leads to the formation of a thin cold film on the ocean surface. Microconvection to ice in this thin surface layer is attributed to nonuniform temperature distributions in wind and water and irregular drag by the air currents. G.G.

N75-24269* Scientific Translation Service, Santa Barbara, Calif.
THE D SUB m(KAPPA, ALPHA 1,..., ALPHA SUB m FUNCTION IN THE OCEAN-CONTINENT TRANSFER PROBLEM
A. A. Dmitriyev *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 26-29 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 27-30 (For availability see N75-24262 15-48)
CSCL 08C

Possible ways of using the orthonormal D sub m functions for studying the kinematics and dynamics in gas and mass exchange between a continent and the atmosphere over the ocean are discussed. G.G.

N75-24270* Scientific Translation Service, Santa Barbara, Calif.
DETERMINING THE PARAMETERS OF THE PROGNOSTIC OPERATOR FOR UNDAMPED FLUCTUATIONS BY THE USE OF THE D SUB m(KAPPA; ALPHA 1,..., ALPHA SUB m) **c47**
A. A. Dmitriyev *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 30-35 ref Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 31-35 (For availability see N75-24262 15-48)
CSCL 04B

The prognostic operator is defined as the matrix or integral operation which, when applied to a set of known values of the vector for various earlier moments of time, predicts a value for the vector at a future moment by the amount ahead of time. If the vector represents a function that decays with time, then the predicted values of the function are given as series expansions in terms of the same functions but with unknown coefficients if some change in the process occurs at the moment of prediction. As examples of such changes are considered: (1) the circulation mechanisms of the atmosphere under the influence of solar activity; (2) brightness fields fluctuations; and (3) wave formations or currents in the ocean after a change in wind field. G.G.

N75-24271* Scientific Translation Service, Santa Barbara, Calif.
TEMPERATURE FIELDS OF AN ABSORPTIVE MEDIUM IN A RADIATING SYSTEM OF ARBITRARY CONFIGURATION

(THE SPATIAL PROBLEM) c47
Yu. A. Surinov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 36-39 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 36-40 (For availability see N75-24262 15-48)
CSCL 04A

A generalized zonal method based on systems of linear algebraic equations is used to determine the temperature fields in an absorptive grey medium filling a closed radiation system that consists of three boundary zones, of which one is adiabatic and the other two are isothermal. The example calculation considers the case of a solenoidal radiation field of local radiative equilibrium. G.G.

N75-24272* Scientific Translation Service, Santa Barbara, Calif.
CALCULATION OF THE RADIATIVE HEAT EXCHANGE IN A CONICAL CAVITY OF COMPLEX CONFIGURATION WITH AN ABSORPTIVE MEDIUM c47
Yu. A. Surinov and V. E. Fedyanin *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 40-45 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 41-46 (For availability see N75-24262 15-48)
CSCL 04A

The generalized zonal method is used to calculate the distribution of the temperature factor on the lateral surface of a conical cavity of complex configuration (a Laval nozzle) containing an absorptive medium. The highest values of the radiation density occur on the converging part of the lateral surface of the complex conical cavity (Laval nozzle). Author

N75-24273* Scientific Translation Service, Santa Barbara, Calif.
AN EXAMPLE OF THE USE OF LABORATORY RESULTS IN THE OPTICS OF THE SEA
V. A. Timofeyeva *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 46-52 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 47-52 (For availability see N75-24262 15-48)
CSCL 08C

A relation between the average cosine in underwater conditions and the coefficient of diffuse reflection is used to determine the optical characteristics of the sea. The cosine is considered equal to the ratio of the radiation flux through a horizontal cross section to the flux irradiating a spherical surface surrounding the observation point. G.G.

N75-24274* Scientific Translation Service, Santa Barbara, Calif.
SOME NEW METHODS OF DETERMINING AND STUDYING THE ABSORPTIVITY OF A MEDIUM AND THE GENERALIZED ANGULAR COEFFICIENTS OF RADIATION c47
Yu. A. Surinov and N. V. Sosnovyy *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 53-56 Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 53-55 (For availability see N75-24262 15-48)
CSCL 04A

Local and average radiation functions, which represent purely geometric characteristics of the radiating system, are used to determine the absorptivity in a system of bodies separated by an attenuating medium. G.G.

N75-24275* Scientific Translation Service, Santa Barbara, Calif.
SOME RESULTS OF THE HYDRODYNAMIC THEORY OF FINITE-AMPLITUDE WAVES
Ya. I. Sekerzh-Zenkovich *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 57-62 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 56-60 (For availability see N75-24262 15-48)
CSCL 08C

Standing waves can be interpreted as free waves between two vertical walls; for a standing wave in an unlimited container there is no transport of liquid mass in the horizontal direction. Standing waves of finite amplitude also possess the following properties not possessed by the waves of the linear theory: (1) there are no motionless points, (2) the points of maximum amplitude (crests and troughs) are fixed, and coincide with the antinodes of the original linear wave, (3) the ordinates of the wave crests are greater in absolute magnitude than the ordinates of the troughs; the wave is similar to a trochoid curve; (4) the wave profile never becomes straight; and (5) the frequency of the oscillations depends not only on the wave length but also on the amplitude. Author

N75-24276* Scientific Translation Service, Santa Barbara, Calif.
CALCULATIONS OF THE HEIGHTS, PERIODS, PROFILE PARAMETERS, AND ENERGY SPECTRA OF WIND WAVES
L. A. Korneva *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 63-68 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 61-67 (For availability see N75-24262 15-48)
CSCL 08C

Sea wave behavior calculations require the precalculation of wave elements as well as consideration of the spectral functions of ocean wave formation. The spectrum of the random wave process is largely determined by the distribution of energy in the actual wind waves observed on the surface of the sea as expressed in statistical and spectral characteristics of the sea swell. G.G.

N75-24277* Scientific Translation Service, Santa Barbara, Calif.
TEMPERATURE WAVES IN A STRATIFIED SEA
Vo VanLan and A. A. Pivovarov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 69-74 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 68-72 (For availability see N75-24262 15-48)
CSCL 08C

Calculations on the effect of density stratification on the propagation of temperature waves show that in layers with a positive maximum density gradient the temperature waves damp out more quickly. In a linear distribution of density with depth and a constant intensity of turbulent exchange, density stratification makes temperature wave amplitudes inversely proportional to density distribution in comparison with values from the open uniform sea. G.G.

N75-24278* Scientific Translation Service, Santa Barbara, Calif.
LONG-DISTANCE RECORDING OF THE HUMIDITY OVER THE SEA c47
V. V. Buklanov and V. M. Klaptsov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 75-80 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 73-77 (For availability see N75-24262 15-48)
CSCL 04B

A procedure is developed for long distance recording of humidity over the sea that uses humidity detectors of the sorption type, whose electrical properties depend on the relative humidity of the air. The moisture sensitive material of the hygristor is the organic polymer polyacrylonitryl, deposited on silver electrodes and thermally treated. In the measurements of the relative humidity from 60% to 95%, the resistance of the hygristor varies from several hundred kiloohms to a few kiloohms, and is an essentially nonlinear function of the humidity. Author

N75-24279* Scientific Translation Service, Santa Barbara, Calif.
PHYSICAL NATURE OF THE CLIMATIC AND BIOLOGICAL EFFECTS OF THE PERU CURRENT c47
A. M. Gusev *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 81-87 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 78-84 (For availability see N75-24262 15-48)
CSCL 04B

Surface and depth flow processes and their effects on the behavior of the Peru current are considered in relation to climatological and biological effects for the entire western coast of South America. The mean annual coastal air temperature is from 2 deg to 6 deg below the norm and precipitation is extremely rare. An upwelling effect brings up the cold deep waters with their rich content of organic material responsible for the huge biological productivity of the region. G.G.

N75-24280* Scientific Translation Service, Santa Barbara, Calif.
DISTRIBUTION OF ENERGY IN THE OCEAN AND ATMOSPHERE AS A RESULT OF THEIR THERMAL AND DYNAMIC INTERACTIONS

A. M. Gusev, V. V. Alekseeyev, and A. A. Aleksandrov *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 88-93 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 85-89 (For availability see N75-24262 15-48)
CSCL 08C

A two dimensional stationary model of the ocean-atmosphere interaction is formulated that satisfies the thermohydrodynamic convection equations in a Boussinesq approximation of heat input from the sun. G.G.

N75-24281* Scientific Translation Service, Santa Barbara, Calif.
ON BOTTOM DENSITY CURRENTS ON THE CONTINENTAL SHELVES
V. N. Anuchin, A. M. Gusev, Yu. G. Pyrkin, and M. M. Khapayev *In its* Phys. of the Sea and Atmosphere NASA-TT-F-16225 May 1975 p 94-99 refs Transl. into ENGLISH from the Conf. on Phys. of the Sea and Atmosphere, Feb. 1974 p 90-94 (For availability see N75-24262 15-48)
CSCL 08C

The turbulent characteristics of bottom density currents on the continental shelves and their influence on the vertical profiles of current velocities are studied by considering plane parallel flows of a liquid with one density in a motionless liquid and with lighter density along an inclined plane. The motion of the liquid is a result of gravitational force directed along the parallel plane. Vertical distribution of turbulent stress is determined from a known average velocity profile and is used to obtain the vertical profile of the average current velocity. G.G.

N75-24282# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
ANALYSIS OF ERTS-A SATELLITE PHOTOS FOR NOAA-AOML STUDY TO DETECT OCEAN EDDIES (SIC) Final Report
E. B. Kraus Oct. 1974 20 p refs
(Grant NOAA-04-3-022-12)
(COM-75-10192/3; NOAA-75012702) Avail: NTIS HC $3.25 CSCL 08C

Photographic data from Landsat 1 of the Lesser Antilles Island arc were studied. It is shown that changes in sea state have a large effect on the amount of backscattered solar radiation reaching a satellite sensor. Preliminary attempts to remove the surface reflectance by photographic differences have not yielded positive results. GRA

N75-24283# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
COLLECTED REPRINTS: 1973. ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORIES Annual Report
Jul. 1974 797 p refs
(COM-75-50164/3; NOAA-75012407; AR-8) Avail: NTIS MF $2.25; SOD HC CSCL 08T

The results of research of NOAA's Atlantic Oceanographic and Meteorological Laboratories and of AOML laboratory, the Ocean Remote Sensing Laboratory, are presented under the following headings: general, physical, oceanography, marine geology and geophysics, ocean remote sensing, and sea-air interaction. GRA

N75-24284# Washington Univ., Seattle. Dept. of Oceanography.
LABORATORY INVESTIGATION OF INTERNAL WAVE GENERATION MODELS
Lon E. Hachmeister and Simon J. Prinsenberg Jan. 1975 64 p refs
(Contract N00014-67-A-0103-0014; Grant NSF GA-30745; NR Proj. 083-012)
(AD-A007351; TR-320; Ref-M74-114) Avail: NTIS CSCL 08/3

Previous theoretical research shows that surface tides transfer energy to internal waves at continental shelf breaks. In an experimental study of the structure of the internal wave energy generated in this region, the authors allow a shallow water surface wave propagating on a linearly stratified fluid to interact with various continental terrace models. The experiments show that the internal wave energy produced both at the shelf-break and along the surface of the continental slope propagates away from the continental terrace in the form of beams of internal waves. GRA

N75-24285# Woods Hole Oceanographic Institution, Mass.
ENERGY EXCHANGE AT THE SURFACE OF THE WESTERN NORTH ATLANTIC OCEAN
Andrew F. Bunker Jan. 1975 111 p refs
(Contract N00014-74-C-0262; NR Proj. 083-004)
(AD-A007296; WHOI-75-3) Avail: NTIS CSCL 04/2

To supplement hydrographic studies of changes in the heat content of water masses, the energy fluxes through the ocean's surface has been estimated. These estimates have been computed from several million surface marine observations utilizing bulk aerodynamic exchange equations. The dependence of the transfer coefficients on wind speed and stability of the air was determined from the literature and used with the ship's data in the equations. The fluxes also have been computed following Budyko's method to serve as a check and comparison. The computations yield the monthly and annual fluxes of latent heat, sensible heat, momentum, and radiational exchange as well as averages of meteorological and oceanographical parameters. Monthly and annual charts of the net heat loss or gain by the ocean have been constructed for 150 acres which extend from the east coast to 30W and from 20N to 50N. Charts of the latent heat, sensible heat, and radiational fluxes also are presented. Time series of the fluxes in different areas have been drafted. Several features revealed by the charts are analyzed and discussed. GRA

N75-24286# Naval Postgraduate School, Monterey, Calif.
SPECTRAL ANALYSIS OF THE ENERGY EXCHANGE AT OWS NOVEMBER M.S. Thesis
Kevin Merle Rabe Mar. 1975 106 p refs
(AD-A007484) Avail: NTIS CSCL 04/2

Oceanographic and meteorological data from Ocean Weather Station (OWS) NOVEMBER were analyzed by statistical and spectral methods in order to describe the nature and periodicities of the air-ocean energy exchange. Salinity data from 1968 through 1970 were compared with daily observed parameters commonly associated with changes in the salinity. Regression analysis showed surface salinity to be highly correlated with surface pressure which is interpreted as the surface salinity responding to a baroclinic transport. Twenty-four years (1947-1970) of daily averaged, observed climatological values, as well as heat exchange terms computed from them, were compared with the sea-surface temperature time series and spectrally analyzed. The spectral analysis yielded spectral density, phase and coherence functions indicating the response of surface temperature to the heat exchange terms. GRA

N75-24287# Washington Univ., Seattle. Div. of Marine Resources.
THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION: AN UNCERTAIN FUTURE
Robert H. Stockman Aug. 1974 123 p refs
(Grant NOAA-04-3-158-42)
(COM-75-10233/5; WSG-74-3; NOAA-75012105) Avail: NTIS HC $5.25 CSCL 05A

A review was made of the evolution of the intergovernmental Oceanographic Commission (IOC) in response to changing international marine needs and to assess the capacity of the commission to respond to increasing international requirements for knowledge about the ocean and marine resources now and in the future. GRA

N75-24288# National Weather Service, Silver Spring, Md. Techniques Development Lab.
SPLASH PROGRAMS USER'S GUIDE
C. P. Jelesnianski and A. D. Taylor Nov. 1974 23 p refs
(COM-75-10181/6) Avail: NTIS HC $3.25 CSCL 08C

Various tropical-storm-surge programs in the National Oceanic and Atmospheric Administration (NOAA) are an actively changing set of subroutines tailored to specific problems. Presently, there are two operational programs, SPLASH 1 and SPLASH 2, in use by the National Hurricane Center (NHC) of NOAA. In this user's and modifiers guide, only prominent features of the more versatile SPLASH 2 model (note, the SPLASH 1 model is a

special case) are discussed. The program is designed for the specific needs of NOAA weather forecasters who have access to a NOAA computer; it is not designed for general use or needs of interested outside users. For a particular problem, such as a special output, change in input data form, etc., the interested user must update or alter the program to fulfill his needs. GRA

N75-24289# Carnegie Institution of Washington, Pasadena, Calif.
WAVE HEIGHT INDICATORS
Henry Carleton Oct. 1974 28 p refs
(Contract MA-2-4178)
(COM-75-10140/2; NMRC-KP-123A) Avail: NTIS HC $3.75 CSCL 08C

Results are presented for a limited literature search into wave measuring equipment that are used aboard ships to observe wave height and wave spectra. Literature that is available on commercial wave meters that are applicable for use by ships in measuring wave height is also reviewed. GRA

N75-24290# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
TIDES AND TIDAL CURRENTS OF NARRAGANSETT BAY
Malcolm Spaulding and Craig Swanson 1974 42 p
(COM-75-10250/9; Marine-TR-35; NOAA-74122701) Avail: NTIS HC $3.75 CSCL 08C

The tidal current and height charts for Narragansett Bay were created primarily for the recreational user notably the sailor. The charts show the hourly velocity to the nearest tenth of a knot, and direction of the tidal currents by means of arrows. A series of hourly tidal height charts shows the height to the nearest tenth of a foot above mean sea level throughout the bay. Also included is a table, on which the charts are based, which gives the time and range of the tides at Newport, RI, from 1975 to 1984. This table is divided into one month per page and subdivided into columns of times and ranges for each year. The time is based on a 24-hour clock, Eastern Standard Time (EST). GRA

N75-24291# National Ocean Survey, Rockville, Md.
VARIABILITY OF TIDAL DATUMS AND ACCURACY IN DETERMINING DATUMS FROM SHORT SERIES OF OBSERVATIONS
Robert Lawrence Swanson Oct. 1974 49 p refs
(COM-75-10275/6; NOAA-TR-NOS-64; NOAA-75021306) Avail: NTIS MF $2.25; SOD HC $3.75 as C55.13:NOS64 CSCL 08C

Tidal datum planes are used to determine the positions of boundaries, as planes of reference for maps and charts, in the design of coastal structures, and to delineate the extent of land uses in coastal areas. Even small differences in accepted values of datums are significant in low-lying coastal areas. The temporal and spatial variability of tidal datums, the length of record used to determine datums, their relationship to the National Geodetic Vertical Datum of 1929, and two methods of determining tidal datums from short series of observations are presented. Statistical analyses of accuracies of datum planes based on short periods of record are given for the United States' East, Gulf, and West Coasts. GRA

N75-24292# Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
MIT SEA GRANT: USING THE SEAS TO SERVE PEOPLE Report, 1 Jul. 1973 - 30 Jun. 1974
25 Dec. 1974 20 p refs
(COM-75-10269/9; MITSG-75-4; NOAA-75021305) Avail: NTIS HC $3.25 CSCL 13B

Sea Grant research at M.I.T. concentrates interdisciplinary efforts on environmentally balanced use of coastal and ocean environments, on obtaining food from the sea, on marine energy and undersea minerals, and on engineering for ocean utilization. The report summarizes work during the period, 1 July 1973 to 30 June 1974, and presents an institutional program summary, and lists publications on the subjects encompassed. Finally a summary of expenditures by activity is included. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-24293*# Kanner (Leo) Associates, Redwood City, Calif.
SOYUZ-16: BIOLOGICAL EXPERIMENTS
B. Gerasimov et al Washington NASA 19 May 1975 51 p refs Transl. into ENGLISH from various Russian articles
(Contract NASw-2481)
(NASA-TT-F-16356) Avail: NTIS HC $4.25 CSCL 06M

Five biological experiments were conducted by the crew of the Soyuz-16 flight. Two of the experiments are scheduled for the joint flight: microbial exchange and zone-forming fungi. Microbe exchange consisted of taking samples from the cosmonauts and the craft. Another microbial experiment studied the effects of weightlessness on the growth of a culture; the microorganisms in space seemed to grow more slowly than control samples on earth. The effects of weightlessness on formation of the vestibular apparatus were studied; Danio rerio eggs were used. Development of the embryo in space was arrested at various stages and will be compared to normal development on earth. Genetic development of higher plants in weightlessness was also studied: Crepis and Arabidopsis seeds were germinated in space; growth was arrested before landing. It was mentioned that similar experiments had been conducted by Skylab astronauts. Author

N75-24294*# Naval Biomedical Research Lab., Oakland, Calif.
STUDIES ON PROPAGATION OF MICROBES IN THE AIRBORNE STATE Annual Report, 1974-1975
R. L. Dimmick, H. Wolochow, and M. A. Chatigny 1975 6 p ref
(Contract NASw-13450)
(NASA-CR-142757; QPR-4) Avail: NTIS HC $3.25 CSCL 06M

C-14 metabolic studies on an aerosol mixture of Escherichia coli and a coliphage are indicative of phage production. G.G.

N75-24295*# Scientific Translation Service, Santa Barbara, Calif.
SEVERAL QUESTION OF THE PHYLOGENY AND SYSTEM OF LACERTILIA (SEU SAURIA)
V. B. Sukhanov Washington NASA May 1973 20 p refs Transl. into ENGLISH from Zool. Zh. (USSR), v. 40, no. 1, 1961 p 73-83
(Contract NASw-2483)
(NASA-TT-F-16354) Avail: NTIS HC $3.25 CSCL 06P

Lizard musculature is shown to demonstrate radically different structural types of locomotor apparatus, scincogeckonomorphous and iguanomorphous. Locomotion of the order Geckota can also be divided into two types; crawling, and a locomotion by which the body, when moving, is raised high above the ground. It is suggested that Geckota and Scincomorpha are different branches of the same line of evolution. The arboreal nature lizard life is seen as the possible cause of the highly modified locomotor apparatus. Author

N75-24296*# Naval Biomedical Research Lab., Oakland, Calif.
STUDIES ON POSSIBLE PROPAGATION OF MICROBIAL CONTAMINATION IN PLANETARY ATMOSPHERES Quarterly Report, 1 Feb. - 30 Apr. 1975
R. L. Dimmick, H. Wolochow, and M. A. Chatigny 30 Apr. 1975 5 p Prepared in cooperation with Calif. Univ., Berkeley
(NASA Order W-13450)
(NASA-CR-142825; QR-1) Avail: NTIS HC $3.25 CSCL 06M

Maintained aerosols were studied to demonstrate the metabolism and propagation of microbes in clouds which could occur in the course of a probe of a planetary atmosphere. Bacteriophage was used as a tool to test whether the mechanisms for DNA production remain intact and functional within the airborne bacterial cell. In one test method, bacteria were mixed with coliphage in an atomizer to allow attachment before aerosolization; in another, two suspensions were atomized saperately into a common air stream prior to aerosolization. Results show that biochemical and physiological mechanisms to allow aerobic microbes to propagate in the airborne state do exist. Author

N75-24297# Advisory Group for Aerospace Research and Development, Paris (France).

MEDICAL REQUIREMENTS AND EXAMINATION PROCEDURES IN RELATION TO THE TASKS OF TODAY'S AIRCREW: COMPARISON OF EXAMINATION TECHNIQUES IN NEUROLOGY, PSYCHIATRY AND PSYCHOLOGY WITH SPECIAL EMPHASIS ON OBJECTIVE METHODS AND ASSESSMENT CRITERIA

H. Oberholz, ed. (Flugmedizinisches Inst. der Luftwaffe, Fuerstenfeldbruck, West Germany) Mar. 1975 100 p refs In ENGLISH; partly in FRENCH Presented at the Aerospace Medical Panel Meeting, Naples, 16-20 Sep. 1974

(AGARD-CP-153) Avail: NTIS HC $4.75

Papers presented at the conference are given. Topics discussed include Rorschach tests, computer measurement of complex performance, nonvisual task processing, pulse wave velocity and psychophysiological reaction patterns, catecholamine excretion from air cadets, flight fitness, fast analytical techniques for the EEG, impact of multivariate analysis on the aviation selection, psychic health and flying fitness examinations, and military aviation psychiatry and neurology. For individual titles, see N75-24298 through N75-24309.

N75-24298 Advisory Group for Aerospace Research and Development, Paris (France).

TEST FOR QUICK AND EARLY DETECTION OF PSYCHIC SYNDROMES MORE FREQUENT IN THE AIR FORCE PERSONNEL **c53**

Luigi Longo (Italian Air Force Appeal Medical Board) *In its* Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 4 p refs (For availability see N75-24297 15-51)

Results and observations are presented which are derived from a test known as a 'test of three random dots'. The test was used to detect early symptoms and psychopathological tendencies in order to prevent their development. The following points were considered in analyzing the results of the tests: the order of distribution of the 3 dots, the type of figure gained by joining the 3 dots, the maximum distance between the lateral dots, and the quadrant of paper in which the center of the figure appears. M.J.S.

N75-24299 Advisory Group for Aerospace Research and Development, Paris (France).

ADMINISTRATION OF THE RORSCHACH TESTS TO A SAMPLE OF STUDENT PILOTS TRAINING APPRENTICESHIP [COMPORTEMENT AU TEST DE RORSCHACH D'UN ECHANTILLON D'ELEVES PILOTES EN PHASES SUCCESSIVES D'APPRENTISSAGE] **c53**

Fabrizio Sparvieri (Schools of the Italian Air Force) *In its* Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 3 p refs In FRENCH (For availability see N75-24297 15-51)

The Rorschach Test was administered to 138 student pilots, 77 were in academic training and 61 were in flying training. Stress and fatigue effects on the quality of student response were compared. It was determined that students in flying training supplied more answers, but of less quality than those in academic training. It was suggested increased psychological stress and fatigue induced by flight situations was the cause of such responses. Transl. by E.H.W.

N75-24300 Naval Aerospace Medical Research Lab., Pensacola, Fla.

COMPUTER MEASUREMENT OF COMPLEX PERFORMANCE **c53**

Richard S. Gibson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p refs (For availability see N75-24297 15-51)

A series of computer controlled performance measurement tests using response latency measures were developed. Three types of performance tasks were used in these tests: an experimenter-paced complex discrimination task, a subject-paced complex discrimination task, and an experimenter-paced stress task. Each task is capable of being presented separately or in conjunction with other tasks. This quality permits the assessment of performance changes as the test environment is changed from a simple single task situation to an increasingly complex multiple task situation. The results indicate that response times under complex conditions are much longer than under simpler task conditions. Task interactions and the need to divide attention greatly increase the time required to respond to any test situation. Some individuals appear to be more able to cope with time-shared conditions than others. In general, the data indicate that much of the traditional human performance data may grossly overestimate performance levels obtainable under real-world conditions. Author

N75-24301 Organization for Health Research, TNO, Amsterdam (Netherlands). Lab. for Ergonomic Psychology.

CHANGES IN VISUAL EVOKED RESPONSE BY NONVISUAL TASK PROCESSING **c53**

J. L. Blom *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 11 p refs (For availability see N75-24297 15-51)

The influence of an auditory binary choice task on the visual evoked response (VER) in man is analyzed. The separation of task and test stimulus and the processing techniques used enabled the demonstration of a significant difference between task and resting conditions, especially in the amplitude levels of wave IV. These observations, together with data from literature form the basis of a neurophysiological hypothesis advanced to explain the responsable mechanisms. It is postulated that, in the waking state, the reticular formation can only be in two states designated resting and busy, which are responsible for the cortical processing of information. The busy state occurs when information is processed and is maintained by cortico-reticular activity during this state. If this activity has been maintained during a certain period of time, return to the resting state is delayed, changing the VER in the period immediately following mental activity. Author

N75-24302 Organization for Health Research, TNO, Amsterdam (Netherlands). Lab. for Ergonomic Psychology.

PULSE WAVE VELOCITY OVER THE VASCULAR WALL AS A MEANS FOR DISTINGUISHING BETWEEN DIFFERENT PSYCHOPHYSIOLOGICAL REACTION PATTERNS TO A MENTAL TASK **c53**

C. H. J. M. Opmeer *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p refs (For availability see N75-24297 15-51)

The influence of a quantitative task of a predominantly mental nature on pulse wave velocity (PWV) was investigated. The time which the pulse wave (caused by the pumping action of the heart) needed to travel along the vascular wall (from heart to right ear lobe) generally decreased (i.e. PWV increased) during a 75 choices per min - task. It seems possible to distinguish two groups: those subjects showing a decreased PWV (supposed to indicate arterial vasoconstriction), and those showing an increased PWV (supposed to be caused by vasodilatation). The continuous PWV-time series appears to be quite irregular (mean SD: 16 ms). A Fourier-analysis performed on these data indicates that the observed increase in the number of oscillations during a heavy task is due to an influence of augmented respiratory rate during this task. Author

N75-24303 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).

CATECHOLAMINE EXCRETION FROM AIR CADETS **c52**

G. Paolucci and G. Blundo *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 3 p refs (For availability see N75-24297 15-51)

As every stress can produce rise on catecholamine rate (as adrenal gland response), these substances in aviators during training were analyzed, in order to establish whether the flight could have some influence in their output. The assessment of the data obtained results in the conclusion that, in air cadets, first flying missions act as a stress, since the catecholamine excretion increases 4 times in comparison with basic values, collected during nonflying duty. Author

N75-24304 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).

FLIGHT FITNESS AND PSYCHO-PHYSIOLOGICAL BEHAVIOR OF APPLICANT PILOTS IN THE FIRST FLIGHT MISSIONS **c53**

Cesare A. Ramacci and Paolo Rota *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 8 p refs (For availability see N75-24297 15-51)

The psycho-physiological behavior of 73 applicant pilots was studied during the flights of a basic training course. On ground and during the 1st, 7th, and 15th mission, the trainees carried out arithmetic calculation consisting of progressive subtractions, and tracked a given outline. In the same missions, in a few trainees, heart rate was continuously recorded with magnetic tape electrocardiograph, and related to flight tasks. The data obtained are discussed with respect to the results of flight final tests, preliminary psychological selection, and previous flight experience, in order to evaluate their importance to flight fitness assessment. Author

N75-24305 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

SOME FAST ANALYTICAL TECHNIQUES FOR THE EEG **c54**

G. H. Byford *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 10 p refs (For availability see N75-24297 15-51)

Three fast single or multichannel techniques were developed and investigated. The shape and size of an electrical signal may be described by means of the amplitude probability density. This statistical characteristic can be calculated on-line for several channels simultaneously, and techniques are available to detect significant differences between one epoch and another of the same channel, or between epochs from different channels. Using a small analogue computer, the signal from a single channel may be divided into 5 frequency bands approximating the accepted physiological definitions; for each, the time course of the integral of signal variance is then plotted automatically at up to 16 times real-time, and the slopes of the curves used to obtain numerical indices of change in eeg activity. It is intuitively satisfactory to describe the eeg in terms of amplitude, frequency and time, but no simple graph will display the interrelationship between these 3 variables. The power spectral density describes the relationship between frequency and amplitude in one epoch; successive spectra can be organized so as to produce a 3 dimensional display, and a technique based on the fast Fourier transform was devised which will satisfactorily decrease the spectral density computer time, by a factor of up to 100. In order to carry out these calculations with adequate speed, a hybrid computing system was developed which may be controlled either from an on-line experiment or from an index placed on one track of an analog FM recording; results are presented as graphs or printed tables. Author

N75-24306 Naval Aerospace Medical Research Lab., Pensacola, Fla.

IMPACT OF MULTIVARIATE ANALYSIS ON THE AVIATION SELECTION AND CLASSIFICATION PROCESS **c53**

Norman E. Lane and Rosalie K. Ambler *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p refs (For availability see N75-24297 15-51)

Continuous quality control which has evolved from the massive use of multivariate statistical techniques made possible by modern computer technology is described along with the selection and classification process from the first coarse screen at widely separated procurement points through the first fleet assignment. Emphasis is on the role of multivariate analysis in the development of statistical forecasts of performance for various points in time within each training option. Among the multivariate techniques that were employed are factor analysis, multiple group discriminant function, and multiple regression analysis. Multiple regression analysis is the most productive and is the principal technique currently used to produce the many series of successive prediction equations which combine quantitative and qualitative data from numerous sources. Comparisons of the multiple regression prediction model with other techniques are made and refinements developed in use of this technique are discussed. These refinements are concerned with minimizing the impact of sampling error on validity, the handling of potential suppressors, and the development of decision rules for variable selection. These decision rules encompass the practical demands of the training situation as well as the mathematical properties of the potential predictors. Author

N75-24307 Direction des Recherches et Moyens d'Essais, Paris (France).

STANDARDIZATION OF OBJECTIVE MEDICO-PSYCHIATRIC QUESTIONNAIRE IN THE FRENCH ARMY [UN QUESTIONNAIRE MEDICO-PSYCHIATRIQUE OBJECTIF STANDARDISE DANS L'ARMEE FRANCAISE] **c53**

Louis Crocq *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p In FRENCH (For availability see N75-24297 15-51)

An objective questionnaire based on data from the psychiatric, neurological, medical, and social history was developed and administered to French Army personnel. Upon completion and verification, the questionnaire is used for initial selection, facilitation of clinical examination and psychological interview, for prognosis of later adaptation, and for easier statistical evaluation and computerization of data. The possible development of a mental hygiene data storage bank from such material was examined. Data are also used to select personnel for specific missions and jobs. Transl. by E.H.W.

N75-24308 Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

PSYCHIC HEALTH: A QUANTITE NEGLIGEABLE IN FLYING FITNESS EXAMINATIONS **c53**

H. P. Goerres *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 6 p refs (For availability see N75-24297 15-51)

After a comparative analysis of possibilities and results of aptitude diagnoses so far applied to applicants by aviation psychologists, experiences gained in routine and psychological follow-up examinations are reported. Various suggestions for the accomplishment of periodic psychologic examinations in the German Air Force are offered and discussed, emphasizing practicability and effectiveness of the different possibilities in detail. It is shown that examinations of this kind could be conducted by the German Air Force without additional expenditures in personnel, provided certain organizational prerequisites are met. Author

N75-24309 Royal Air Force Central Medical Establishment, London (England).

SIXTEEN YEARS EXPERIENCE IN MILITARY AVIATION PSYCHIATRY AND NEUROLOGY **c53**

P. J. OConnor *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 3 p refs (For availability see N75-24297 15-51)

The wastage of aircrew due to psychiatric causes is discussed. One approach to psychiatric selection is to forecast how a cadet will withstand the stress of flying on the evidence of his previous life history; the approach was investigated. Two ways of tackling psychiatric wastage are found to be the physiological measurement of the cadet's ability to adapt to stress, and the acceptance of the fact that the only test for fitness for flying is the flying itself. It is found that neurological wastage of aircrew is much smaller than psychiatric wastage, and that routine electroencephalography may futher reduce neurological wastage by identifying those likely to develop epilepsy. Author

N75-24310# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).

REACTIVATING POTENCY OF SOME OXIMES TOWARDS PHOSPHYLATED ACETYLCHOLINESTERASE

L. P. A. DeJong 1974 21 p refs
(TDCK-65518; CL-1974-12) Avail: NTIS HC $3.25

Pyridinium-2 aldoximes and bis-pyridinium 4-aldoximes are potent reactivators. Bulky substituents at pyridinium nitrogen influence only slightly the reactivating potency of the pyridinium-2 aldoximes. Aliphatic and thiadiazolyl oximes studied do not, or only very slightly, restore the activity of acetylcholinesterase inhibited by Tabun. An ester and some amides of oximinoacetic acid turned out to be moderate reactivators towards acetyl cholinesterase. The other aliphatic oximes and the thiadiazolyl oximes have only a weak reactivating potency. Author (ESRO)

N75-24311# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
PUNCTUATION OF TRANSCRIPTION IN VITRO OF THE TRYPTOPHAN OPERON OF ESCHERICHIA COLI. A NOVEL TYPE OF CONTROL OF TRANSCRIPTION
Hans Pannekoek (Leiden Univ.), William J. Brammar (Edinburgh Univ.), and Peter H. Pouwels 1975 37 p refs
(MBL-1975-4; TDCK-65817) Avail: NTIS HC $3.75

Ribonucleic acid (RNA) is transcribed in vitro from DNA of a tryptophan (trp) transducing strain of bacteriophage phi 080 which contains the trp regulatory elements and consists of a polycistronic messenger transcribed from the structural genes, and possibly the regulatory region, and a separate RNA species which is transcribed from the regulatory region. During transcription of the trp operon RNA polymerase frequently is rejected at a specific site ahead of the first structural gene. The termination factor is not involved in this process. A different protein fraction, which specifically stimulates the synthesis of trp enzymes in an in vitro protein-synthesizing system was found to antagonize the abortive synthesis of trp mRNA. A model is proposed for the control of transcription by means of a positive control factor.
ESRO

N75-24312# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
IN VITRO SYNTHESIS OF ENZYMES OF THE TRYPTOPHAN OPERON OF ESCHERICHIA COLI. PART 2: STUDIES ON THE SPECIFICITY OF INITIATION OF TRANSCRIPTION
P. H. Pouwels and J. VanRotterdam 1975 30 p refs
(MBL-1975-5; TDCK-65816) Avail: NTIS HC $3.75

In vitro synthesis of enzymes of the tryptophan (trp) operon of Escherichia coli was studied in an extract prepared from Escherichia coli, which is programmed with purified DNA from trp transducing phages with mutations that affect the expression of the trp genes in various ways. Results show that control of transcription, i.e. initiation and termination, is similar in vivo and in vitro.
Author (ESRO)

N75-24313# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
IN VITRO SYNTHESIS OF ENZYMES OF THE TRYPTOPHAN OPERON OF ESCHERICHIA COLI. PART 3: EVIDENCE FOR POSITIVE CONTROL OF TRANSCRIPTION
P. H. Pouwels and J. VanRotterdam 1975 31 p refs
(MBL-1975-6; TDCK-65818) Avail: NTIS HC $3.75

A protein fraction, called At (anti termination) factor, was isolated from extracts Escherichia coli and partially purified. The At factor stimulates the synthesis in vitro of anthranilate synthetase, an enzyme encoded by two genes of the tryptophan (TRP) operon, but has no effect on the synthesis of T7 RNA polymerase and other T7 and T4 coded proteins. The At factor stimulates the synthesis of trp mRNA; it has no effect on the translation of trp mRNA. It is concluded that in vitro transcription of the trp operon is positively controlled.
ESRO

N75-24314# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
A CHANGED ATP-DEPENDENT DNAASE: THE CHARACTERIZATION OF THE ENZYME FROM ESCHERICHIA COLI rorA
Bob VanDorp, Rob Benne, and Franco Palitti 1974 24 p refs
(Contract EURATOM-052-65-2-BIAN)
(MBL-1974-38; TDCK-65633) Avail: NTIS HC $3.25

The ATP-dependent DNAases from Escherichia coli wild-type and rorA were isolated, purified, and their enzymatic properties compared. The enzymes were found to differ in the amount of ATP that is consumed during DNA degradation. This difference can be influenced by the reaction conditions and the nature of the substrate.
Author (ESRO)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-24315*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 139
Mar. 1975 78 p refs
(NASA-SP-7011(139)) Avail: NTIS HC $4.00 CSCL 05B

The biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space are referenced. Similar effects on biological organisms of lower order are also included. Related topics such as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors are discussed. Applied research is emphasized, but references to fundamental studies and theoretical principles related to experimental development are also included. A total of 242 reports, articles, and other documents are listed.
Author

N75-24316*# Kanner (Leo) Associates, Redwood City, Calif.
SOME PROCEDURAL PROBLEMS IN AUTOMATIC ANALYSIS OF ELECTROCARDIOGRAMS
N. S. Molchanov and L. V. Chireykin Washington NASA 19 May 1975 19 p refs Transl. into ENGLISH from Kardiologiya. (USSR) v. 14, no. 3, Mar. 1974 p 141-147
(Contract NASw-2481)
(NASA-TT-F-16357) Avail: NTIS HC $3.25 CSCL 06B

Five tasks of automatic EKG analysis are listed, and five methods of instruction set formation, including the medical evaluation method and three methods of verification of EKG characteristics, are listed and discussed. The table of advisability of use of various methods of verification, as a function of the automatic EKG analysis task is presented. Representation of formalized EKG descriptions and verification of the effectiveness of automatic EKG analysis methods are discussed.
Author

N75-24317# Civil Aeromedical Inst., Oklahoma City, Okla.
PREDICTIVE VALIDITIES OF SEVERAL CLINICAL COLOR VISION TESTS FOR AVIATION SIGNAL LIGHT GUN PERFORMANCE
Karen N. Jones (Oklahoma Univ., Norman), Jo Ann Steen, and William E. Collins Jan. 1975 14 p refs
(AD-A606792; FAA-AM-75-2) Avail: NTIS HC $3.25

Scores on the American Optical Company (AOC) test (1965 edition), Dvorine test, Farnsworth Lantern test, Color Threshold Tester, Farnsworth-Munsell 100-Hue test, Farnsworth Panel D-15 test, and Schmidt-Haensch Anomaloscope were obtained from 137 men with color defective vision and 128 men with normal color vision. The validity of each of these tests in predicting scores on the aviation signal light gun was assessed by using daytime and nighttime administrations of the light gun as the criteria. Two best sets of plates from the AOC and Dvorine tests were selected by calculating a multiple regression equation in a stepwise manner with the nighttime and then the daytime administration of the signal light gun test as the criteria.
Author

N75-24318*# Scientific Translation Service, Santa Barbara, Calif.
SPINAL EFFECTS OF AN ELECTRICAL VESTIBULAR STIMULATION IN MAN
M. Lacour, M. Bonnet, and J. P. Roll Washington NASA May 1975 23 p refs Transl. into ENGLISH from Acta Oto-Laryngol. (Uppsala), v. 78, no. 5-6, 1974 p 399-409
(Contract NASw-2483)
(NASA-TT-F-16314) Avail: NTIS HC $3.25 CSCL 06P

The effects of a bipolar and monaural electrical vestibular stimulation on the excitability of spinal reflexes (monosynaptic reflex of Hoffman) are studied. This stimulation causes an increase in amplitude of H-reflexes. The results demonstrate also a reflex reactivity different for each leg: the facilitation of H-reflex is always higher for the non-preferred leg. The notions of vestibular prevalence and of asymmetrical reflex reactivity in rear limbs are discussed in the framework of a differential central control over symmetrical effector and receptor structures.
Author

N75-24319*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TOXIC SUBSTANCES ALERT PROGRAM

Thomas L. Junod Apr. 1975 118 p
(NASA-TM-X-71711; E-8329) Avail: NTIS HC $5.25 CSCL 06T

The Toxic Substances Alert Program at the Lewis Research Center is described and a profile of each of the 102 toxic substances procured during a recent 12 month period is given. The goal of the Toxic Substances Alert Program is to ensure that the health and safety personnel are aware which toxic substances are being used and to alert and inform the users as to their toxic characteristics. The program provides a continuing record of the toxic substances being procured, who has procured them, what other toxic substances the user has obtained in the past and where similar materials have been used elsewhere at the Center. Author

N75-24320*# Scientific Translation Service, Santa Barbara, Calif.
HOT AIR STERILIZATION
G. B. Roemer Washington NASA Jun. 1975 7 p Transl. into ENGLISH from Deut. Med. Wochenschr. (West Germany), v. 13, no. 100, 1975 p 709-710
(Contract NASw-2483)
(NASA-TT-F-16384) Avail: NTIS HC $3.25 CSCL 06E

Different temperature and sterilization times are given for the hot air sterilization of syringes and needles. A temperature of 170 C for 30 minutes or 160 C for 60 minutes was found effective. Prerequisites for maintenance and safety procedures involved in such a process are also included. Author

N75-24321*# Scientific Translation Service, Santa Barbara, Calif.
BIOLOGICAL EXPERIMENTS ON SALYUT-4
Washington NASA 25 Apr. 1975 29 p refs Transl. into ENGLISH from Russian reports
(Contract NASw-2483)
(NASA-TT-F-16267) Avail: NTIS HC $3.75 CSCL 06S

The biological experiments conducted during the Soyuz-17 - Salyut-4 flight are discussed. Microorganism growth under weightlessness was studied using a coliform bacilli culture. The importance of man's presence during such spaceflights is stressed. Author

N75-24322*# Scientific Translation Service, Santa Barbara, Calif.
THE TESTING OF PERIPHERAL VISION
H. Snellen and E. Landolt Washington NASA May 1975 37 p refs Transl. into ENGLISH from the mono. "Handbuch der Gesammten Augenheilkunde" Leipzig, W. Engelmann, v. 3, 1874 p 52-71
(Contract NASw-2483)
(NASA-TT-F-16312) Avail: NTIS HC $3.75 CSCL 06P

This is a section of a work on ophthalmology. The authors discuss the use of the perimeter and related devices in testing the limits of peripheral vision and of the blind spot, as well as testing for peripheral distinction of brightness, shape and color. Author

N75-24323*# Scientific Translation Service, Santa Barbara, Calif.
ON ROD VISUAL ACUITY AND CONE VISUAL ACUITY
A. Eugen Fick Washington NASA May 1975 24 p refs Transl. into ENGLISH from Arch. Ophtalmol. (Berlin), v. 45, 1898 p 336-356
(Contract NASw-2483)
(NASA-TT-F-16315) Avail: NTIS HC $3.25 CSCL 06P

Measurements of rod and cone visual acuity are presented which confirm the theory of Schultze and von Kries that rods and cones are responsible for dark-adapted and light-adapted vision, respectively. Dark adapted visual acuity becomes less with increasing intensity of illumination, due to the fact that the stimulus is too strong to be confined to individual rods, and spreads to the adjoining ones. Author

N75-24324*# Kanner (Leo) Associates, Redwood City, Calif.
PROBLEMS OF SPACE BIOLOGY. VOLUME 26: STATISTICAL ANALYSIS OF THE CARDIAC RHYTHM AND HEMODYNAMIC INDICES IN PHYSIOLOGICAL RESEARCH
A. D. Voskresenskiy and M. D. Venttsel Washington NASA May 1975 234 p refs Transl. into ENGLISH of the book "Problemy kosmicheskoy biologii. Tom 26. Statisticheskiy analiz serdechnogo ritma i pokazateley gemodinamiki v fiziologicheskikh issledovaniyakh" Moscow, Nauka Press, 1974 p 1-221
(Contract NASw-2481)
(NASA-TT-F-16196) Avail: NTIS HC $7.50 CSCL 06P

Possibilities of estimation of the cardiac cycle length from recordings of sequences of interpulse intervals, by the use of digital filtration and correlation analysis methods with the Dnepr digital computer, are discussed. Cardiac rhythm characteristics of healthy people at rest and changes in the characteristics under various experimental conditions, such as bed rest, orthostatic tests, increasing CO2 concentrations and hypoxia, and relationships between the dynamic characteristics of the cardiac rhythm, pneumograms and arterial pressure are discussed. By the use of specific examples of EKG R-R curves and time segments between specific points on the curves, recorded on magnetic tape, an analysis is made of a large group of experimental situations, for selection of informative sets of indices and criteria for classification of the observations, leading to demarcation of indices of several states of the cardiovascular system. Remarks are made in conclusion concerning practical use of the formal schemes of classification of observations. Author

N75-24325# Technische Hogeschool, Delft (Netherlands). Man-Machine Systems Group.
A MULTI-DISCIPLINARY TEAM FOR THE TREATMENT OF PATIENTS WITH DEFECT UPPER EXTREMITIES: A NEED FOR OPTIMAL REHABILITATION
W. J. Luitse (Rehabilitation Center (De Hoogstraat), Leersum, Netherlands) and H. G. Stassen Dec. 1974 20 p refs
(WTHD-67) Avail: NTIS HC $3.25

A multi-disciplinary team is discussed, which deals with the problems of amputees and patients with lesions of the plexus cervico brachialis. The growth of such a team and the procedure for treating patients are described. Special attention is paid to the results of the cooperation between research units and rehabilitation centers in the development and research of assistive devices, in the problem of acceptance, and in the clinical evaluation. The advantages and disadvantages of an orthotic prosthetic team are discussed. Author

N75-24326*# Scientific Translation Service, Santa Barbara, Calif.
EFFECTS OF MUSCULAR EXERCISE ON VARIATION IN PLASMA CORTISOL AND GLUCOSE IN NORMAL MALES
M. Follenius and Gabrielle Brandenberger Washington NASA May 1975 18 p refs Transl. into ENGLISH from the Eur. J. Appl. Physiol., (France) no. 33, 1974 p 23-33
(Contract NASw-2483)
(NASA-TT-F-16257) Avail: NTIS HC $3.25 CSCL 06P

The dynamics of plasma cortisol and glucose levels during and after submaximal muscular exercise was studied at 5-minute intervals and compared to the daytime variations observed at rest. Muscular exercise performed on a bicycle ergometer was shown to modify the normal excretion pattern of plasma cortisol. Glucose concentrations show a transient drop during exercise, followed by a rise to the initial level after the end of the muscular activity. The temporal relations between plasma cortisol and plasma glucose concentrations suggest that adaptive reactions of the pituitary-adreno-cortical axis may contribute to the recovery of the initial glucose level. Author

N75-24327*# National Aeronautics and Space Administration, Washington, D.C.
ROLE OF METABOLIC SHIFTS IN THE PATHOGENESIS OF VESTIBULAR DISTURBANCES
Yu. F. Udalov and E. V. Lapayev Jun. 1975 6 p Transl. into ENGLISH from Voyenno-med. Zh. (USSR), no. 10, Oct. 1974 p 64-66
(NASA-TT-F-16431) Avail: NTIS HC $3.25 CSCL 06S

The effects of certain metabolic shifts due to flight activity on vestibular stability and acceleration tolerance are studied in a series of laboratory and in-flight experiments. The results of these experiments are analyzed, particularly, the effects of shifts in protein, pyridoxine, and serotonin metabolism on vestibular stability. Metabolic shifts were greater during decreased vestibular tolerance. However, comparison of blood amino acid content during flight days showed unexpected increases in most amino acids in pilots with decreased vestibular tolerance. It is noted that vestibular dysfunction can occur in persons with high vestibular tolerance and is not only due to lack of proper training, but can also be the result of an incorrect diet; polyvitamins

with pyridoxine or special pyridoxine supplements are recommended. Author

N75-24328# Battelle Pacific Northwest Labs., Richland, Wash.
[STUDIES ON INSTRUMENTATION, RADIATION AND CHEMICAL PHYSICS, NUCLEAR MEDICINE, AND ARTIFICIAL HEART PROGRAM. PART 4: PHYSICAL AND ANALYTICAL SCIENCES] Annual Report, 1973
J. M. Nielsen Feb. 1974 127 p refs
(Contract AT(45-1)-1830)
(BNWL-1850-Pt-4) Avail: NTIS HC $5.75

Separate abstracts were prepared for each of the 4 sections of the report. Publications on the research made during the year are listed. NSA

N75-24329# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
THE INFLUENCE OF IONIZING RADIATION ON THE IMMUNE RESPONSE [DE INVLOED VAN RADIOACTIEVE STRALING OP IMMUNOLOGISCHE AFWEER-MECHANISMEN]
O. BrocadesZaalberg 1974 17 p refs In DUTCH; ENGLISH summary
(MBL-1974-28; TDCK-65585) Avail: NTIS HC $3.25

The effects of ionizing radiation on the immune response are reviewed. Following an introduction on the function of the immune apparatus, the effect of radiation in the different cell types of the immune system is described. The possible consequences of these effects on the prognosis of radiation victims are discussed. ESRO

N75-24330# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
THE CAUSE OF DEATH RESULTING FROM TRANSFUSION RESISTANT SHOCK. PART 1: INFLUENCE OF BRAIN DAMAGE [DE DOODSOORZAAK BIJ TRANSFUSIE-RESISTENTE SHOCK. 1. DE BETEKENIS VAN DE BESCHADIGING VAN DE HERSENEN]
M. Wijnans, J. A. Luthjens-Neijhoff, and P. VanEck 1975 65 p refs In DUTCH; ENGLISH summary
(MBL-1975-1; TDCK-65628) Avail: NTIS HC $4.25

The influence of brain damage on the cause of death resulting from transfusion resistant, i.e. irreversible, shock was investigated in rats. Unanesthetized rats, cannulated the preceding day, were bled from an artery. In animals bled from the carotid artery (car-group) increased intracranial pressure was the main cause of death, whereas in animals bled from the iliac artery (ilgo-group) the blood pressure steadily declined to 35mm of Hg, then the cornea reflex disappeared, respiration stopped, and the blood pressure suddenly fell to zero. In animals bled from the iliac artery (il40 schedule) the effect of occlusion of one or two carotid arteries was studied. The implications for human pathology are that in patients with insufficient blood supply to the brain a drop in the blood pressure may lead to a sudden increase of pressure on the brain, from which death may result. ESRO

N75-24331# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
RESPIRATORY AND INTRAPERITONEAL INFECTION OF MICE WITH ENCEPHALOMYOCARDITIS VIRUS: EFFECT OF SUBLETHAL X-IRRADIATION ON HOST RESISTANCE AND SURVIVAL
W. J. C. Bogaerts and B. J. Durville-Vanderoord 1975 23 p refs
(MBL-1975-2; TDCK-65777) Avail: NTIS HC $3.25

The relationships governing host resistance to viral infection were evaluated in mice following respiratory or peritoneal infection with three strains of encephalomyocarditis (EMC) virus, which were antigenically similar but differed in virulence. Host resistance to each strain was evaluated by determining the mean lethal dose LD50, and the mean infectious dose ID50. The contribution of non-specific resistance to the overall defense of the host was assessed in mice that had received 450 R of X-irradiation prior to viral infection. Experimental results indicate that host capacity to resist respiratory infection exceeds that for peritoneal infection for the three EMC strains. It is concluded that respiratory inoculation of virus affords better immunization against EMC virus infection than does peritoneal infection. Author (ESRO)

N75-24332# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
PROPERTIES OF uvrE MUTANTS OF ESCHERICHIA COLI K12. PART 1: EFFECTS OF UV IRRADIATION ON DNA METABOLISM
Cornelis A. VanSluis, Ina E. Mattern, and M. C. Paterson 1974 21 p refs Sponsored partly by Med. Res. Council of Can.
(MBL-1974-25; TDCK-65293) Avail: NTIS HC $3.25

Escherichia coli K12 uvrE is a mutator strain which is highly sensitive to ultraviolet radiation. In an attempt to determine the underlying molecular basis for the UV sensitivity, a mutant and an isogenic wild type strain were compared with regard to several metabolic responses to 254 nm radiation. The introduction of single strand breaks into intracellular DNA after irradiation is normal; however, the rate of excision of pyrimidine dimers as well as of DNA degradation and final rejoining of the strand breaks is lower in the mutant as compared to the repair proficient strain. These data suggest that the uvrE gene product may be involved in a reaction between the incision and excision steps in the excision repair process. Author (ESRO)

N75-24333# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
PROPERTIES OF uvrE MUTANTS OF ESCHERICHIA COLI K12. PART 2: CONSTRUCTION AND PROPERTIES OF pol AND rec DERIVATIVES
Ina E. Mattern and P. C. Houtman 1974 22 p refs
(MBL-1974-26; TDCK-65294) Avail: NTIS HC $3.25

Viability and sensitivity to ultraviolet radiation and X-rays as well as frequency of spontaneous mutations was investigated for some double mutant strains of Escherichia coli and compared with parent strains. ESRO

N75-24334# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
RADIOSENSITIZATION OF BIOLOGICALLY ACTIVE DNA IN CELLULAR EXTRACTS BY OXYGEN. EVIDENCE THAT THE PRESENCE OF SH-COMPOUNDS IS NOT REQUIRED
J. J. VanHemmen, W. J. A. Meuling, and J. F. Bleichrodt 1974 22 p refs
(MBL-1974-29; TDCK-65368) Avail: NTIS HC $3.25

The radiosensitization by oxygen of biological active bacteriophage DNA in bacterial extracts was studied. The oxygen effect in such a system appeared not to be due or due only to a minor extent to the presence of endogenous sulfhydryl compounds. The components in a cell extract which enable oxygen and other sensitizers to sensitize DNA could not be destroyed by extremely high doses of gamma radiation. Author (ESRO)

N75-24335# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
MUTAGENESIS BY ULTRAVIOLET RADIATION IN BACTERIOPHAGE PHI X 174: ON THE MUTATION STIMULATING PROCESSES INDUCED BY ULTRAVIOLET RADIATION IN THE HOST BACTERIUM
J. F. Bleichrodt and W. S. D. Verheij 1974 23 p refs
(MBL-1974-30; TDCK-65367) Avail: NTIS HC $3.25

The fraction of mutants measured in a population of ultraviolet irradiated bacteriophage phi X174 is higher when the mutants are assayed on host cells irradiated with a small dose of UV than when unirradiated cells are used for assay. Evidence is presented that the UV-induced processes in the bacteria which are responsible for the increased number of mutants introduce mutations prior to the replication of the double-stranded replicative form DNA to which the parental single-stranded phi X174 DNA is converted after infecting the host cell. These processes also result in an enhanced fraction of spontaneous mutants in unirradiated populations of phi X174. Author (ESRO)

N75-24336# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
FAST AND EASY PRODUCTION OF MONOLAYER PLAQUE ASSAY SLIDES
Gerard D. Majoor (Med. Faculteit Maastricht, Neth.), Mars B. VantVeer, and OttO B. Zaalberg 1974 7 p refs

(MBL-1974-31; TDCK-65564) Avail: NTIS HC $3.25

A fast and easy method for the production of monolayer plaque-assay slides, making use of double adhesive tape, is described. This technique is used for the detection of single antibody forming cells. Author (ESRO)

N75-24337# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

AN ALTERNATIVE THERAPY AGAINST ORGANOPHOSPHATE POISONING

O. L. Wolthuis 1974 23 p refs

(MBL-1974-32; TDCK-65575) Avail: NTIS HC $3.25

Respiratory inhibition caused by organophosphate poisoning is only partially antagonized by oxime therapy because of a difficulty of oximes to pass the blood brain-barrier. Medicaments aimed at bridging the period of respiratory failure by converting residual muscular twitches to contractures of sufficient duration for adequate respiratory movements were investigated. A number of semi-synthetic compounds such as 9-anthroic acid are experimented with. Such a therapy would have the advantage of being independent of the peripheral or central nature of the respiratory block. ESRO

N75-24338# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

THE INNERVATION OF CHICK STRIATED MUSCLE FIBRES BY THE CHICK CILIARY GANGLION IN TISSUE CULTURE

Jacob Hooisma, Dick W. Slaaf, E. Meeter, and Willem F. Stevens 1974 14 p refs Sponsored in part by Found. PROMESO and Found. for Med. Res. FUNGO

(MBL-1974-33; TDCK-65577) Avail: NTIS HC $3.25

The formation in tissue culture of neuromuscular junctions (synaptogenesis) from the autonomic ciliary ganglion and leg muscle fibers in the chick was investigated. The autonomic ciliary ganglion in the chick contains two types of neurons only, one of which innervates fast striated muscle in the ciliary body and sphincter of the iris. Electrophysiological and pharmacological properties of newly formed junctions, nicotinic in nature, were studied. Results show that junctional innervation is accomplished in 24 hours. ESRO

N75-24339# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

PREFERENTIAL RELEASE OF NEWLY SYNTHESIZED ACETYLCHOLINE BY CORTEX SLICES FROM RAT BRAIN

P. C. Molenaar (Leiden Univ.) and R. L. Polak 1974 20 p refs

(MBL-1974-34; TDCK-65584) Avail: NTIS HC $3.25

The release of newly synthesized acethylcholine (ACh) by rat brain cortex slices was studied by incubating the slices for 5 min in a high potassium medium containing C-14 pyruvate in order to label the acetyl moiety and tritiated or deuterated choline to label the choline moiety of ACh. It was found that C-14 ACh as well as tritiated or deuterated ACh immediately after their formation had a greater change of being released than stored ACh. It was concluded that there are two pools of ACh in the tissue, one large, in which the turnover of ACh is slow, and another one small, in which a rapid turnover of ACh takes place and from which it is readily released. An analysis by means of subcellular fractionation of slices immediately after incubation with H-3 choline did not reveal the identity and localization of the small pool, although evidence was obtained that it was localized in the cholinergic nerve endings. ESRO

N75-24340# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

PURIFICATION AND CHARACTERIZATION OF AN ENDONUCLEASE FROM CALF THYMUS ACTING ON IRRADIATED DNA

Silvia Bacchetti and Rob Benne 1974 34 p refs

(Contract EURATOM-107-72-1-BIAN)

(MBL-1974-35; TDCK-65576) Avail: NTIS HC $3.75

An endonuclease acting on DNA exposed to ultraviolet light or gamma-rays was extensively purified from calf thymus. The enzyme has a pH optimum at pH 7.0 to 7.5, acts with equal efficiency in the presence of EDTA or divalent cations (Mg 2+ or Ca 2+), is inhibited by NaCl and tRNA and is inactivated by incubation at 50 C. Its molecular weight, determined by Sephadex chromatography or SDS-gel electrophoresis, is + or - 30,000. The enzyme catalyzes the formation of single-strand breaks with 5'-phosphate termini in double-stranded DNA irradiated with ultraviolet or gamma-rays. It does not act on unirradiated DNA or denatured DNA. The enzymatic activity on ultraviolet- and gamma-irradiated DNA is associated with the same protein. The site of action of the enzyme in ultraviolet-irradiated DNA is a photoproduct other than pyrimidine dimers, and can also be induced by irradiation of the DNA in vivo. Author (ESRO)

N75-24341# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

TRANSCRIPTION OF BACTERIOPHAGE MU: AN ANALYSIS OF THE TRANSCRIPTION PATTERN IN THE EARLY PHASE OF DEVELOPMENT

Carel Wijffelman and Pieter VanDePutte 1974 29 p refs

(MBL-1974-36; TDCK-65586) Avail: NTIS HC $3.75

The direction of transcription of mu phage was determined by RNA-DNA hybridizations between purified mu-RNA and the seperated strands of lambda mu hybrid phages. The direction of transcription is from the c-gene end of the heavy strand to the beta-end. Thermo-inducible defective mu lysogens, in which the prophage is deleted from the beta-end, have a normal early transcription pattern, but the increase of RNA at later times is absent. A defective lysogen, still has an early transcription pattern similar to that of the wild type. Therefore, it was concluded that the early RNA is transcribed from that region of the mu genome. The early mu-RNA synthesis is negatively regulated with a minimum of transcription at 9 minutes after induction. Author (ESRO)

N75-24342# Naval Submarine Medical Research Lab., Groton, Conn.

SHALLOW HABITAT AIR DIVE SERIES (SHAD 1 AND 2): THE EFFECTS ON VISUAL PERFORMANCE AND PHYSIOLOGY Medical Research Progress Report

Jo Ann S. Kenney, S. M. Luria, Mark S. Strauss, Christine L. McKay, and Helen M. Paulson 2 Oct. 1974 29 p refs

(AD-A007104; NSMRL-793; MRPR-4) Avail: NTIS CSCL 06/19

In order to determine the safe depths at which divers can live while breathing air, a battery of medical, physiological, and performance tests were administered to subjects who lived for a month in the Nav Sub Med Rsch Lab pressure chamber at 50 ft and at 60 ft. The tests included a number of measures of visual physiology and visual performance, since many of the symptoms of oxygen toxicity involve the visual system. The results showed no decrements in visual acuity or in the size of the field of view at either 50 ft or 60 ft. There were no abnormal changes in the EEG during saturation, and the only changes in the visual evoked response occurred during excursions from the saturated depth. GRA

N75-24343# Stanford Univ., Calif. Inst. for Communication Research.

HEALTH CARE AND SATELLITE RADIO COMMUNICATION IN VILLAGE ALASKA Final Report, Aug. 1971 - Dec. 1974

Osvaldo Kreimer, Heather Hudson, and Dennis Foote Jun. 1974 429 p refs

(Contract NO1-LM-1-4718)

(PB-238742/1) Avail: NTIS HC $11.25 CSCL 06E

The summary is the first section of the final report of the evaluation of the ATS-1 medical communication system in Alaska. The second section introduces the background of these studies and the sociogeographic setting and health situation of the Alaska natives. The third section presents the main research findings about both the aides-to-doctor and doctor-to-doctor exchanges, about use of the system for medical education, and about its social impact on Bush Alaska. A fourth section is devoted to a cost analysis of alternative systems and recommendations. The attachments (charts, tables, data gathering instruments, etc.) comprise a fifth section. GRA

N75-24344# Washington Univ., Seattle. Bioelectromagnetics Research Lab.

QUANTITATION OF MICROWAVE RADIATION EFFECTS ON THE EYES OF RABBITS AT 2450 MHz AND 918 MHz

Arthur W. Guy, James C. Lin, Piro O. Kramar, and Ashley F. Emery Jan. 1974 52 p refs
(Contract N00014-67-A-0103-0025; NR Proj. 201-055)
(AD-A007521; Scientific-2) Avail: NTIS CSCL 06/18

Studies on the microwave cataractogenic effects have been going on for many years. Despite the multitude of published information on the mechanism and time and power density threshold, very few of these papers present sufficient quantitative results useful for the purpose of extrapolation to man and, subsequently, establishment of safe human exposure guides. The present project was designed to ascertain the conditions and mechanisms of cataract production in laboratory animals by microwave irradiation and to extrapolate quantitatively the animal results to human exposures to provide data for the establishment of realistic safety standards. This report describes incident and absorbed power relationships in animal eyes exposed to near zone 2450 MHz and 918 MHz radiation, threshold of cataractogenesis, effect of general body hypothermia, chronic subthreshold exposure results, and a study of the induced temperature rises in the eye. GRA

N75-24345# Washington Univ., Seattle. Bioelectromagnetics Research Lab.
ANALYSIS OF CENTRAL NERVOUS SYSTEM INVOLVEMENT
Eugene M. Taylor and Bonnie T. Ashleman Jan. 1974 11 p refs
(Contract N00014-67-A-0103-0026; NR Proj. 201-054)
(AD-A007581) Avail: NTIS CSCL 06/18

Nine cats were prepared for the recording of potentials in three brain sites evoked by acoustic and microwave stimuli. Loci in which potentials were observed were eighth cranial nerve, medial geniculate nucleus and primary auditory cortex. The effect of cochlear disablement on these potentials was evaluated. Potentials at all sites were abolished by cochlear damage. There were no differences between acoustic and microwave stimuli in this regard. Data are interpreted as supporting the contention that the microwave auditory effect is mediated at the periphery as are the effects of conventional acoustic stimuli. GRA

N75-24346# Washington Univ., Seattle. Bioelectromagnetics Research Lab.
MEASUREMENT OF ABSORBED POWER PATTERNS IN THE HEAD AND EYES OF RABBITS EXPOSED WITH TYPICAL MICROWAVE SOURCES
Arthur W. Guy, James C. Lin, Piro Kramar, and Ashley F. Emery Jul. 1974 5 p refs Presented at the 19th Conf. on Precision Electromagnetic Meas., London, 1-5 Jul. 1974
(Contract N00014-67-A-0103-0025; NR Proj. 201-055)
(AD-A007524) Avail: NTIS CSCL 06/18

The electromagnetic field and power patterns, both in and outside the rabbit's head and eye were established by special measurement techniques while the animals were exposed to a 2450 MHz diathermy C director. These quantitative measurement techniques were extended to include animals exposed to a broad class of radiation sources such as corner reflectors, slots, cavities and horns. GRA

N75-24347# Washington Univ., Seattle. Bioelectromagnetics Research Lab.
ELECTROPHYSIOLOGICAL EFFECTS OF ELECTROMAGNETIC FIELDS ON ANIMALS
Arthur W. Guy, James C. Lin, and C. K. Chou Jun. 1974 45 p refs Presented at the 7th Rochester Intern. Conf. on Environ. Toxicity, Rochester, N. Y. Jun. 1974
(Contract N00014-67-A-0103-0026; NR Proj. 201-054)
(AD-A007520) Avail: NTIS CSCL 06/18

The report shows that the conduction and transmission latencies and amplitudes of evoked potentials in both the CNS of anesthetized cats, isolated nerves of cats, and ganglia of rabbits are affected by CW microwaves in a manner very similar to that of localized conduction heat. Temperature rises are always associated with any observable changes of the measured characteristics in the nervous tissues exposed to CW irradiation. Electrophysiological studies on cats indicate that pulsed microwaves interact with mammalian auditory systems in a manner similar to that of conventional acoustic perception. A possible mechanism of microwave interaction is the acoustic energy release from rapid thermal expansion due to power absorption in the gross structure of the head. GRA

N75-24348# Technion - Israel Inst. of Tech., Haifa. Dept. of Building Climatology.
PREDICTION OF PHYSIOLOGICAL RESPONES TO WORK, ENVIRONMENT AND CLOTHING Final Technical Report, 1 Jul. 1973 - 30 Jun. 1974
Baruch Givoni Sep. 1974 43 p refs
(Contract DAJA37-73-C-4024; DA Proj. 2N0-61102-B-71D)
(AD-A007282; TR-1) Avail: NTIS CSCL 06/19

A biophysical model has been developed in this research, which describes the dynamic, time pattern, response of the mean skin temperature to variations in the metabolic rate, ambient climatic conditions and clothing thermophysical properties. From the analysis of experimental results of experiments, it has been found that the core-to-skin temperature gradient could be predicted as a function of the metabolic rate, the environmental conditions and the clothing thermophysical properties. This gradient, in turn, can then serve as basis for the computation of the peripheral conductance. A comparison between the predicted patterns of the mean skin temperature for different combinations of metabolic rates, environmental conditions and clothing, with the patterns measured in a series of physiological experiments, showed a good agreement between the predicted and measured patterns under conditions of rest and work. GRA

N75-24349# School of Aerospace Medicine, Brooks AFB, Tex.
LABORATORY ASSESSMENT OF PILOT PERFORMANCE USING NONRATED SUBJECTS AT THREE ALCOHOL DOSE LEVELS Final Report, Mar. 1972 - Apr. 1974
Peter H. Henry, James A. Flueck, and Malcolm C. Lancaster Dec. 1974 224 p refs
(AF Proj. 7930)
(AD-A007727; SAM-TR-74-27) Avail: NTIS CSCL 06/19

To evaluate the effects of drugs and environmental stresses on pilot psychomotor performance, an automated system was developed around a Link GAT-1 flight trainer. Performance was electronically scored during 1-hour simulations of cross-country instrument flight, using special purpose analog and digital logic. The sensitivity of this system was assessed by observing the acute effects of three graded doses, 0.3, 0.6, and 0.9 gm/kg body weight, of ethyl alcohol on scored performance. Three separate experiments were conducted using a total of 22 male subjects, ages 21 to 29. GRA

N75-24350# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
HUMAN TEMPORARY THRESHOLD SHIFT AND RECOVERY FROM 24 HOUR ACOUSTIC EXPOSURES
Charles W. Nixon, David W. Krantz, and Daniel L. Johnson Jan. 1975 25 p refs
(AF Proj. 7231)
(AD-A007842; AMRL-TR-74-101) Avail: NTIS CSCL 06/16

The effects on hearing sensitivity of 24 hour monotic exposures to a narrow band noise with the center frequency at 1000 Hz at sound intensities of 80, 85, and 90 db(A) were evaluated. Automatic audiometry was used to assess changes in hearing from baseline levels for six test frequencies during exposure and during subsequent recovery. Among the results (1) TTS (Temporary Threshold Shift) growth and recovery was present for 1000, 1500, and 2000 Hz test frequencies only, (2) TTS reached a maximum or asymptote between 8 and 16 hours exposure, (3) TTS induced by the 85 and 90 db(A) exposure levels exceeded the limits specified by CHABA (Committee on Hearing, Bioacoustics and Biomechanics) damage risk criteria and (4) long duration exposures of 85 and 90 db(A) require at least 24 hours of rest prior to subsequent exposure. GRA

N75-24351# Environmental Protection Agency, Arlington, Va. Office of Noise Abatement and Control.
INFORMATION ON LEVELS OF ENVIRONMENTAL NOISE REQUISITE TO PROTECT PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY Final Report
Mar. 1974 175 p refs
(PB-239429/4; EPA-550/9-74-004) Avail: NTIS MF $2.25; SOD HC $4.60 as EP1.2:N69/26 CSCL 06S

Noise levels consistent with the protection of public health

and welfare against hearing loss, annoyance, and activity interference are identified. GRA

N75-24352# Bureau of Radiological Health, Rockville, Md.
BIOLOGIC EFFECTS AND HEALTH HAZARDS OF MICROWAVE RADIATION
Oct. 1973 362 p refs Proc. of an Intern. Symp., Warsaw, 15-18 Oct. 1973 Sponsored by WHO and Min. of Health and Soc. Welfare, Warsaw
(PB-239554/9) Avail: NTIS HC $10.00 CSCL 06R

The symposium was held to facilitate the exchange and evaluation of current information about the biologic and health effects of microwave radiation, and, in this way, to focus attention on those areas in which additional information is needed and new approaches can be developed. Sixty participants from 12 countries took part and 30 scientific papers were presented during the 4-day period October 15-18, 1973. GRA

N75-24353# American National Standards Inst., New York.
GENERAL SAFETY STANDARD FOR INSTALLATIONS USING NON-MEDICAL X-RAY AND SEALED GAMMA-RAY SOURCES, ENERGIES UP TO 10 MeV
E. H. Eisenhower Feb. 1975 70 p refs Revised Sponsored in part by NBS, Washington, D. C.
(COM-75-50166/8; ANSI-n543-1974-Rev; NBS-H-114-Rev) Avail: NTIS MF $2.25; SOD HC as C13.11:114 CSCL 18F

Requirements for the design and operation of common types of installations which use gamma and X-radiation for non medical purposes are established to protect persons who work with or are near such installations, as well as the general public, against excessive exposure to radiation. Maximum permissible dose limits established by the National Council on Radiation Protection and Measurements are cited. Methods for achieving adequate radiation protection are described, including structural details, surveys and inspections, and operating procedures. GRA

N75-24303 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).
CATECHOLAMINE EXCRETION FROM AIR CADETS
G. Paolucci and G. Blundo *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 3 p refs (For availability see N75-24297 15-51)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-24354# General Applied Science Labs., Inc., Westbury, N.Y.
PSYCHOPHYSICAL TESTS OF POTENTIAL DESIGN/CERTIFICATION CRITERIA FOR ADVANCED SUPERSONIC AIRCRAFT Final Report
Thomas H. Higgins and Earnest A. Sanlorenzo Feb. 1975 83 p refs
(Contract DOT-FA73WA-3203)
(AD-A009296; GASL-789; FAA-RD-75-10) Avail: NTIS HC $4.75 CSCL 06S

A subjective evaluation of simulated sonic booms heard indoors and outdoors has been carried out to assess the validity of a simple formulation for estimating perceived noise levels. Using a psychoacoustic experiment design based on magnitude estimation of the perceived level, it was shown that the subjective response was consistent with the predictions of both the simple formula for PLdb as well as PLdb determined from an analysis of the sonic boom stimuli using the MARK VII procedure. With regard to acceptability of the sonic boom, it was found that the sonic boom when heard indoors was significantly less acceptable than when heard outdoors for the same level of PLdb. In particular the present data indicate: (1) 90 PLdb(1) when heard inside and measured outside is acceptable to 98% of the subjects tested; (2) when heard inside and measured inside, the PLdb(1) and 98% acceptability is equivalent to 69 PLdb(1) (-21 PLdb attenuation); and (3) heard outside and measured outside 90 PLdb(1) is acceptable to 80% of the tested subjects. Author

N75-24355# Technische Hogeschool, Delft (Netherlands). Man-Machine Systems Group.
ON THE ACCEPTANCE, FUNCTIONAL GAIN AND MENTAL LOAD IN ARM PROSTHESIS AND ORTHOSIS CONTROL
M. Soede (Organization for Health Research TNO, Amsterdam), J. S. M. J. VanDieten, and H. G. Stassen Nov. 1974 20 p refs
(WTHD-66) Avail: NTIS HC $3.25

The problem of acceptance of arm prostheses and orthoses is discussed. Available clinical and field data show that only a very small percentage of prostheses for upper extremities are really worn by patients; one of the reasons may be the large amount of attention needed to control and to use these devices. This can lead to a lack of attention to other tasks, which in turn may be explained in terms of mental load. A perliminary experiment to measure the reduction of attention caused by controlling an arm prosthesis is discussed. Futher research is proposed in order to gain optimal design rules, to define better criteria to prescribe prostheses, and to set up optimal training programs. Author

N75-24356# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
A PILOT/LSO SIMULATION CONDUCTED TO INVESTIGATE AIRCRAFT WAVE-OFF PERFORMANCE AND TO DETERMINE THE ABILITY OF THE LANDING SIGNAL OFFICER TO JUDGE AIRCRAFT APPROACHES Final Report
Ronald L. Nave 16 Dec. 1974 43 p refs
(AD-A007515; NADC-74112-30) Avail: NTIS CSCL 01/3

A fixed base carrier landing simulation including both the pilot and the landing signal officer (LSO) was performed to investigate aircraft wave-off performance and to evaluate the functions of the LSO. Minimum aircraft design requirements are recommended based on the simulation results. GRA

N75-24357# Army Aeromedical Research Unit, Fort Rucker, Ala.
AVIATOR VISUAL PERFORMANCE IN THE UH-1 STUDY 2
Thomas L. Frezell, Mark A. Hofmann, Allen C. Snow, and Richard P. Nutt Mar. 1975 46 p refs
(DA Proj. 3A0-61101-A-91C)
(AD-A007812; USAARL-75-11) Avail: NTIS CSCL 05/8

The study monitored, via the corneal reflection technique, visual performance of Army aviators while flying incline maneuvers in a UH-1 helicopter. Visual performance, to include time and transition information, was gathered over 13 sectors. In addition to visual data, performance measurements were recorded simultaneously on an incremental digital recorder. Results acquired by both techniques are provided. GRA

N75-24358# Arizona State Univ., Tempe.
VISUAL AND AUDITORY INFORMATION PROCESSING ASPECTS OF THE ACQUISITION OF FLYING SKILL Final Report
Robert C. Haygood, Barry Leshowitz, Stanley R. Parkinson, and Edward E. Eddowes Dec. 1974 62 p refs
(Contract F41609-72-C-0037; AF Proj. 1138)
(AD-A007721; AFHRL-TR-74-79) Avail: NTIS CSCL 05/10

The result of a number of experimental studies of human auditory and visual information processing behavior and their possible relationship to the student pilot's acquisition of flying skill were explored in terms of conceptual model developed for this study. The results were interpreted in terms of the potential interfering effects of the intake of and response to information processed during flying tasks and in terms of the student pilot's nonoptimal information processing strategies during his acquisition of flying skill. GRA

N75-24298 Advisory Group for Aerospace Research and Development, Paris (France).
TEST FOR QUICK AND EARLY DETECTION OF PSYCHIC SYNDROMES MORE FREQUENT IN THE AIR FORCE PERSONNEL
Luigi Longo (Italian Air Force Appeal Medical Board) *In its* Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 4 p refs (For availability see N75-24297 15-51)

N75-24299 Advisory Group for Aerospace Research and Development, Paris (France).
ADMINISTRATION OF THE RORSCHACH TESTS TO A SAMPLE OF STUDENT PILOTS TRAINING APPRENTICESHIP [COMPORTEMENT AU TEST DE RORSCHACH D'UN ECHANTILLON D'ELEVES PILOTES EN PHASES SUCCESSIVES D'APPRENTISSAGE]
Fabrizio Sparvieri (Schools of the Italian Air Force) *In its* Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 3 p refs In FRENCH (For availability see N75-24297 15-51)

N75-24300 Naval Aerospace Medical Research Lab., Pensacola, Fla.
COMPUTER MEASUREMENT OF COMPLEX PERFORMANCE
Richard S. Gibson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p refs (For availability see N75-24297 15-51)

N75-24301 Organization for Health Research, TNO, Amsterdam (Netherlands). Lab. for Ergonomic Psychology.
CHANGES IN VISUAL EVOKED RESPONSE BY NON-VISUAL TASK PROCESSING
J. L. Blom *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 11 p refs (For availability see N75-24297 15-51)

N75-24302 Organization for Health Research, TNO, Amsterdam (Netherlands). Lab. for Ergonomic Psychology.
PULSE WAVE VELOCITY OVER THE VASCULAR WALL AS A MEANS FOR DISTINGUISHING BETWEEN DIFFERENT PSYCHOPHYSIOLOGICAL REACTION PATTERNS TO A MENTAL TASK
C. H. J. M. Opmeer *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p refs (For availability see N75-24297 15-51)

N75-24304 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).
FLIGHT FITNESS AND PSYCHO-PHYSIOLOGICAL BEHAVIOR OF APPLICANT PILOTS IN THE FIRST FLIGHT MISSIONS
Cesare A. Ramacci and Paolo Rota *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 8 p refs (For availability see N75-24297 15-51)

N75-24306 Naval Aerospace Medical Research Lab., Pensacola, Fla.
IMPACT OF MULTIVARIATE ANALYSIS ON THE AVIATION SELECTION AND CLASSIFICATION PROCESS
Norman E. Lane and Rosalie K. Ambler *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p refs (For availability see N75-24297 15-51)

N75-24307 Direction des Recherches et Moyens d'Essais, Paris (France).
STANDARDIZATION OF OBJECTIVE MEDICO-PSYCHIATRIC QUESTIONNAIRE IN THE FRENCH ARMY [UN QUESTIONNAIRE MEDICO-PSYCHIATRIQUE OBJECTIF STANDARDISE DANS L'ARMEE FRANCAISE]
Louis Crocq *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 7 p In FRENCH (For availability see N75-24297 15-51)

N75-24308 Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
PSYCHIC HEALTH: A QUANTITE NEGLIGEABLE IN FLYING FITNESS EXAMINATIONS
H. P. Goerres *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 6 p refs (For availability see N75-24297 15-51)

N75-24309 Royal Air Force Central Medical Establishment, London (England).
SIXTEEN YEARS EXPERIENCE IN MILITARY AVIATION PSYCHIATRY AND NEUROLOGY
P. J. OConnor *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 3 p refs (For availability see N75-24297 15-51)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-24359*# Essex Corp., Alexandria, Va.
DEVELOPMENT AND VALIDATION OF METHODS FOR MAN-MADE MACHINE INTERFACE EVALUATION Final Report
Thomas B. Malone and Angelo Micocci Mar. 1975 35 p
(Contract NASw-2747)
(NASA-CR-142824) Avail: NTIS HC $3.75 CSCL 05H

The alternate methods of conducting a man-machine interface evaluation are classified as static and dynamic, and are evaluated. A dynamic evaluation tool is presented to provide for a determination of the effectiveness of the man-machine interface in terms of the sequence of operations (task and task sequences) and in terms of the physical characteristics of the interface. This dynamic checklist approach is recommended for shuttle and shuttle payload man-machine interface evaluations based on reduced preparation time, reduced data, and increased sensitivity of critical problems. Author

N75-24360*# Hamilton Standard, Windsor Locks, Conn.
PHASE 1 ENGINEERING AND TECHNICAL DATA REPORT FOR THE THERMAL CONTROL EXTRAVEHICULAR LIFE SUPPORT SYSTEM
Mar. 1975 329 p refs
(Contract NAS9-13574)
(NASA-CR-141793; HSPC-75.TO5) Avail: NTIS HC $9.50 CSCL 06K

A shuttle EVLSS Thermal Control System (TCS) is defined. Thirteen heat rejection subsystems, thirteen water management subsystems, nine humidity control subsystems, three pressure control schemes and five temperature control schemes are evaluated. Sixteen integrated TCS systems are studied, and an optimum system is selected based on quantitative weighting of weight, volume, cost, complexity and other factors. The selected sybsystem contains a sublimator for heat rejection, a bubble expansion tank for water management, and a slurper and rotary separator for humidity control. Design of the selected subsystem prototype hardware is presented. Author

N75-24361*# Scientific Translation Service, Santa Barbara, Calif.
CENTER FOR TECHNICAL SUBMARINE STUDIES AND RESEARCH
Washington NASA Jun. 1975 10 p refs Transl. into ENGLISH from Descriptive Brochure (France) p 1-18
(Contract NASw-2483)
(NASA-TT-F-16385) Avail: NTIS HC $3.25 CSCL 06K

The major phases of development of the French Center for Technical Submarine Studies and Research are presented. Its main fields of activity are described: life in a confined atmosphere, softwater production, noise measurements, rescue devices, under-water vision, deep-sea exploration. Some indications on present and future projects are given. Author

N75-24362*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY QUARANTINE: SUPPORTING RESEARCH AND TECHNOLOGY Semiannual Review, 1 Jul. - 31 Dec. 1974
D. M. Taylor 18 Apr. 1975 119 p refs
(Contract NAS7-100)
(NASA-CR-142878; JPL-900-710) Avail: NTIS HC $5.25 CSCL 22B

Planetary quarantine strategies for advanced missions are described, along with natural space environment studies and post launch recontamination studies. Spacecraft cleaning and decontamination techniques and assay activities are reviewed. Teflon

ribbon experiments and pyrolsis gas-liquid chromatography study are also considered. J.A.M.

N75-24363# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioural Sciences Div.
AERODROME AIR TRAFFIC CONTROL IN THE CANADIAN FORCES
L. G. Innes Nov. 1974 29 p refs
(DCIEM-74-R-1067) Avail: NTIS HC $3.75

Analysis of the functions performed by Canadian Forces air traffic controllers is the basis for a tower cab design which reduces many of the problems presently encountered in visual control. Comfortable work stations are provided for a crew of up to three people. The design, suitable for use at all CF bases, incorporates solid-state multiplexed communications, cordless lightweight headsets, CRT displays for data and radar information, mechanized traffic data logging, microfiche reference files, and chairs specially designed for use by controllers. Author

N75-24364# Technische Hogeschool, Delft (Netherlands). Man-Machine Systems Group.
THE LIGHTSPOT OPERATED TYPEWRITER: THE EVALUATION OF A PROTOTYPE
H. G. Stassen, M. Soede (Organization for Health Research TNO, Amsterdam), and W. J. Luitse (Rehabilitation Centre (De Hoogstraat), Leersum, Netherlands) Nov. 1974 22 p refs
(WTHD-65) Avail: NTIS HC $3.25

The lightspot operated typewriter (LOT) was developed in order to meet the minimum requirement for communication by a certain group of physically disabled. The range of possibilities may be estimated between a simple communication channel with the environment and a professional apparatus. The first prototype was tested clinically during a special evaluation program, which was focused on the acceptance of user and environment, on the technical functioning, and on the mental and physical load of the patient. As a result of this evaluation study, a second prototype was developed in order to improve some technical points and to improve the ergonomics of the LOT; a character display of 80 characters was added to the system. Author

N75-24365# Universities Center, Jackson, Miss.
ARTIFICIAL HEART CONTROLS SUPPORT Final Report, 1 Aug. 1973 - 31 Jul. 1974
F. M. Donovan, Jr. 1974 83 p refs
(Contract AT(40-1)-4485)
(ORO-4485-2) Avail: NTIS HC $4.75

Detailed design information concerning power and control requirements for the intermediate nuclear powered artificial heart system is presented. In the absence of energy storage the nuclear powered artificial heart must be capable of supplying 3.07 watt of blood power for an indefinite period of time. With energy storage the heart must be able to supply 2.3 watt of blood power for an indefinite period of time with a maximum of 3.07 watt for shorter periods. Regulation of cardiac output in response to atrial pressure is sufficient steady state control provided that the output can go from 5 to 12 liter/min without requiring the atrial pressure to go below -2 mmHg nor above +10 mmHg. The artificial heart must be capable of responding to relatively small changes in atrial pressure within one heart beat and be able to go from 5 liter/min to 12 liter/min within about one minute. Author (NSA)

N75-24366# Raytheon Co., Bedford, Mass. Missile Guidance Lab.
ADVANCED HELMET MOUNTED SIGHT STUDY PROGRAM Final Report
Wesley J. Haywood, Jr. and Daniel J. McMahon Mar. 1975 118 p
(Contract F33615-72-C-1480; AF Proj. 7184)
(AD-A007874; AMRL-TR-73-10) Avail: NTIS CSCL 19/5

The report discusses the system analysis, which is intentionally general, and the fabrication of a laboratory model of the helmet mounted sight incorporating the basic principles of operation. The model is designed to demonstrate a capability, by logical extension, of meeting the objective specification. The objective was met as evidenced by the acceptance tests of the hardware. GRA

N75-24367# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
REAL TIME DISPLAY PARAMETERS STUDY 2 Final Report, Sep. 1973 - Sep. 1974
Marjorie J. Krebs and Leonard Lorence Feb. 1975 83 p
(Contract F30602-73-C-0377; AF Proj. 6244)
(AD-A007790; RADC-TR-75-43) Avail: NTIS CSCL 09/5

The purposes of the study were (1) to explore the effects of prior task-related experience on FLIR (Forward Looking InfraRed) target acquisition and (2) to determine the effects of several real-time imagery related variables on target acquisition. Three groups of subjects were tested including trained FLIR operators, photo interpreters, and untrained college students. The thirty subjects were presented with airborne video-taped FLIR imagery which had been edited into 15-second segments. Eleven different targets were included in the stimulus set ranging from large industrial facilities to small military vehicles. Detection, classification and identification time, and accuracy were recorded. Scanning patterns were also recorded using the viewing hood oculometer. GRA

N75-24368# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
MANUAL CONTROL IN TARGET TRACKING TASKS AS A FUNCTION OF CONTROLLER CHARACTERISTICS: A FLIGHT STIMULATOR INVESTIGATION, PHASE 2
James McGuinness, Thomas G. Drennen, and James G. Curtin 15 Sep. 1974 97 p refs
(Contract N00014-72-C-0264; NR Proj. 196-120)
(AD-A007384; MDC-E1148) Avail: NTIS CSCL 05/5

An investigation was conducted of fingertip controllers which were integrated into an aircraft throttle and used in a target acquisition and tracking task. The experimental variables included two types of controllers (force and displacement), and two types of output function (linear and step), under three levels of gain and three levels of target speed. In the evaluation, sixteen pilots performed an aircraft control task in addition to a target tracking task in a fixed base flight simulator. Absolute pitch and roll deviations were obtained to measure aircraft control error. Measures of target tracking task performance included target acquisition time and error, time on target, X and Y axis tracking error, overshoots and control reversals. The results demonstrated that the force controller in combination with a step function was associated with a statistically significant increase in acquisition and tracking proficiency when compared to other controller/output function combinations. GRA

N75-24305 Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
SOME FAST ANALYTICAL TECHNIQUES FOR THE EEG
G. H. Byford *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Mar. 1975 10 p refs (For availability see N75-24297 15-51)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N75-24369# California Univ., Berkeley. Lawrence Berkeley Lab.
CHEMICAL EVOLUTION
M. Calvin 18 May 1974 45 p refs Presented at the Conf. at the Mitsubishi Kasei Inst. of Life Sci., Tokyo, 18 May 1974 Sponsored by ERDA
(LBL-3319; Conf-740576-1) Avail: NTIS HC $3.75

The period in which molecules were being formed and transformed and built up to reach a size and complexity that could contain and sustain the living process leading to life is discussed. The essence of the molecular nature of living things is arrived at by chemical means. An attempt is made to reconstruct those possible processes from what is known about today's chemistry. The elements described in molecular terms begin with the appearance of small molecules (amino acids), then the appearance of polymers of those amino acids and nucleic acids to give large molecules that ultimately have specific structure, and then give rise to specific shapes and sizes. This involved

the evolution of molecules, the evolution of polymers, the evolution of catalysts, and the evolution of information such that these processes can be repeated over and over again, leading to biological evolution. NSA

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N75-24370 Purdue Univ., Lafayette, Ind.
ALGEBRAIC TECHNIQUES FOR THE ANALYSIS AND DESIGN OF DIGITAL FILTERS Ph.D. Thesis
William Kenneth Jenkins 1974 226 p
Avail: Univ. Microfilms Order No. 75-10901

The algebraic properties are analyzed of the machine-implemented algebra of a digital filter. The use of interval algebras implemented in a computer-aided design program to monitor quantization errors in recursive digital filters is discussed. The application of interval methods to digital filters of arbitrary order and configuration was developed theoretically, and illustrated through a variety of experimental analyses. A user-oriented program QUINTAP is presented as a means of implementing the concepts in a way that is suitable for use in practical design problems. The study of algebras resulted in the idea of coding digital filters in residue number systems for the purpose of improving accuracy, increasing speed, or decreasing costs through hardware multiplexing. The design of digital hardware based on residue algebras is treated in detail for nonrecursive filters of high order. Dissert. Abstr.

N75-24371 Purdue Univ., Lafayette, Ind.
MAN-MACHINE COMMUNICATIONS: AN EXAMINATION OF THE MACHINES Ph.D. Thesis
Robert Louis Belleville 1974 170 p
Avail: Univ. Microfilms Order No. 75-10845

The devices and systems which form the man-machine interface are examined primarily from the standpoint of the computer aided problem solver's need for input interactivity. Existing devices are categorized and listed with the global usage, drawbacks, and system interface. An interactive terminal is described which provides a standard interface for input devices and provides output to the user in the form of closed circuit television. Two new interactive usages of video - the video cursor and video tablet are also described. An inexpensive technique for the production of speech is described. Two methods for the artificial perception of color are described which provide recognition accuracies of better than 95%. An example of the use of a color syntax which can locate and recognize postage stamps is also included. Dissert. Abstr.

N75-24372# Sandia Labs., Albuquerque, N.Mex.
PROCEEDINGS OF THE SYMPOSIUM ON DIGITAL SIGNAL PROCESSING
M. A. Soderstrand, ed. Nov. 1974 47 p refs Symp. held at Albuquerque, N. Mex., 18 Nov. 1974
(Contract AT(29-1)-789)
(SAND-74-8672; Conf-741138) Avail: NTIS HC $3.75

Seven papers and summaries of two papers are presented. Topics include (1) the digital filter as a systems element; (2) signal processing applications at LLL; (3) system processing activities at SLL; (4) digital system development in Organization 1100; (5) signal processing activities at LASL; (6) recursive digital filter structures and applications; (7) stability in two-dimensional recursive digital filters; (8) some aspects of spectral analysis and waveform reconstruction; and (9) optical data processing. NSA

N75-24373# Oak Ridge Y-12 Plant, Tenn.
DIRECT DIGITAL NUMERICAL CONTROLLER FOR MACHINE TOOLS
G. L. Bowers, C. M. Lay, and T. L. Williams 28 Jan. 1975 54 p refs
(Contract W-7405-eng-26)
(Y-1966) Avail: NTIS HC $4.25

A direct digital numerical controller (DDNC) was developed as an alternative to the current numerical control (NC) concept with the expectation of improving the performance and the design criteria for an NC controller. DDNC offers several improvements over commercially available NC, such as: (1) magnetic core memory replacement of the tape reader during machining, (2) capability of remote loading via a high-speed transmission line from the computer, (3) part-description data stored in highly efficient binary format rather than EIA code, (4) size savings of 75% in required floor space with a significant reduction in circuit components and accompanying maintenance, and (5) greater than 50% cost savings. Full, five-axis, continuous-path contouring (using linear interpolation) is available on the DDNC with manual control features basically the same as those found on NC units. DDNC units were installed on three Ex-Cell-O two-axis turning machines, and a number of parts were machined. DDNC proved to be a practical, economical, and reliable method for machine-tool control. Author (NSA)

N75-24374# Massachusetts Inst. of Tech., Cambridge. Computation Structures Group.
AN ASYNCHRONOUS LOGIC ARRAY
Suhas S. Patil Jan. 1975 32 p refs
(Grant NSF DCR-74-21822)
(PB-238681/1; CSG-Memo-111; NSF/OCA-DCR-74-21822)
Avail: NTIS HC $3.75 CSCL 09B

An asynchronous logic array for the general synthesis of asynchronous digital circuits is presented. The parallel and asynchronous nature of the array gives the realized systems the speed and characteristics of hardwired circuits even though they are implemented in a uniform diode array with appropriate terminating circuits. The logic array is particularly suited for implementing the control structures and should help extend the field of micron control to the asynchronous and parallel computers. GRA

N75-24375# Automatic Data Processing Equipment Selection Office (Navy), Washington, D.C.
COBOL COMPILER VALIDATION SYSTEM (1974) (X3.23-1974) ANS COBOL 1974. INTERPROGRAM COMMUNICATION MODULE TEST SPECIFICATIONS Interim Report
28 Nov. 1974 49 p
(AD-A002975; USN-CCVS-74-Vol-12) Avail: NTIS CSCL 09/21

This document represents one of 14 volumes comprising the preliminary documentation for the 1974 U.S. Navy COBOL Compiler Validation System (CCVS). The 1974 CCVS will consist of audit routines, their related data, and an execution routine (VP-Routine) which prepares the audit routine for compilation. Each audit routine is a COBOL program which includes many tests and supporting procedures indicating the result of the tests. The audit routines collectively contain all of the features of American National Standard Programs Language COBOL - X3.23-1974 (except for the ENTER statement of the Nucleus module) as specified in Federal Information Processing Standard (FIPS) 21-1. GRA

N75-24376# Mitre Corp., Bedford, Mass.
REMOTE-TERMINAL EMULATOR (DESIGN VERIFICATION MODEL): INTRODUCTION AND SUMMARY
D. L. James and D. W. Lambert Feb. 1975 79 p refs
(Contract F19628-75-C-0001; AF Proj. 572D)
(AD-A007827; MTR-2677-Vol-1; ESD-TR-74-372) Avail:

NTIS CSCL 09/2

The Remote-Terminal Emulator is a minicomputer-based system which generates message traffic for use in testing and evaluating large-scale multi-terminal computer systems. This series of reports describes the two Design-Verification Models that were developed on Data General NOVA 800 minicomputers. This volume discusses the background for emulator work at MITRE and summarizes the development program. General concepts are discussed, and the hardware and software of the Design-Verification Models are described. GRA

N75-24377# Colorado Univ., Boulder. Dept. of Computer Science.
USING BLOSSOMS TO FIND MAXIMUM MATCHINGS ON GRAPHS Final Report
Harold Gabow Sep. 1974 40 p refs
(PB-238971/6; CU-CS-056-74) Avail: NTIS HC $3.75 CSCL 12B

A matching on a graph is a set of edges, no two of which share a vertex. The problem discussed is to find a matching with the greatest number of edges possible. An algorithm is presented that implements the concept of blossoms, as developed by Edmonds, completely and efficiently. The computation time is proportional to (V sup 3). The algorithm can be used in an algorithm that computes maximum weighted matchings efficiently. GRA

N75-24378# Iowa State Univ. of Science and Technology, Ames. Cyclone Computer Lab.
HARDWARE-SOFTWARE INTERACTIONS IN SYMBOL-2R'S OPERATING SYSTEM
Hamilton Richards, Jr. and Arthur E. Oldehoeft Nov. 1974 9 p refs
(Grant NSF GJ-33097)
(PB-239220/7; ISU-CCL-7401) Avail: NTIS HC $3.25 CSCL 09B

A description is given of the chief attributes of the virtual processor placed at the disposal of each user of the SYMBOL-2R time-shared multiprocessor system, and the mechanisms by which SYMBOL's hardwired operating system manages processing-mode transitions for individual virtual processors and allocates hardware resources-processors and memory space - among competing virtual processors. Provisions by which the unusually high-level capabilities of the hardware are augmented by software, and contrasts the structure of the software component of the operating system with that of the hardware component are given. Finally, the hardware/software partition of resource-allocation functions, in which allocation policies are controlled by software and executed by hardware are described. GRA

N75-24659 Joint Publications Research Service, Arlington, Va.
SETUP OF ADMINISTRATIVE COMPUTER SERVICE DESCRIBED
Pal Konyves-Toth *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 16-19 Transl. into ENGLISH from Szamitastechnika (Budapest), v. 6, no. 3, Mar. 1975 p 1/5 (For availability see N75-24655 15-99)

N75-24660 Joint Publications Research Service, Arlington, Va.
ROMANIAN COMPUTERS AND OFFICE EQUIPMENT DESCRIBED
Dinu Buznea *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 24-33 Transl. into ENGLISH from Electrotehn., Electron., si Automatica; Automatica si Electron. (Bucharest), no. 1, Mar. 1975 p 1-6 (For availability see N75-24655 15-99)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-24379 Pennsylvania State Univ., University Park.
ESTIMATION WITH QUANTIZED MEASUREMENTS Ph.D. Thesis
John Charles Keenan 1974 133 p
Avail: Univ. Microfilms Order No. 75-9791

An algorithm was developed for estimating the state of a linear system from quantized measurements of the output of that system. The system was driven by a white zero mean Gaussian disturbance, and the output of the linear system was corrupted, prior to quantization, by a white zero mean Gaussian measurement noise. The estimator was an unbiased minimum variance estimator which was constrained to be recursive. The form of the estimator was linear in terms of the innovation, and the quantizer was represented as a linear transformation, operating on the output of the linear system, followed by a parallel collection of scalar quantizers. The basic estimator was a time-varying filter which reduced to the Kalman filter in the limiting case of an infinite number of quantization levels with infinitesimal steps between adjacent levels. The proposed quantized data filter was extensively tested in a digital computer simulation. Dissert. Abstr.

N75-24380 Purdue Univ., Lafayette, Ind.
APPLICATION OF COMPUTER CONTROLLED MONITORING AND DATA REDUCTION TO POTENTIOMETRY AND VOLTAMMETRY Ph.D. Thesis
John Joseph Zipper 1974 150 p
Avail: Univ. Microfilms Order No. 75-10989

Two different types of electrochemical measurements, potentiometry and voltammetry, were computerized. In both cases, the path taken was to develop the best possible measurement apparatus and approach for the particular experiment. Then a programming package consisting of BASIC with assembly language subroutines was developed to control the experiment and monitor the output. In the study of computerized potentiometric measurements, a multiplexable potentiometer to monitor up to 5 ion-selective electrodes in a flowing stream was developed. A standard addition approach was used, with a rigorous least squares adjustment routine to determine unknown concentration. The analog instrumentation had to deal with the problem of the high bandpass required for multiplexing. It was also required to have as low a high frequency noise level and drift rate as possible. The combination of analog potentiometer, digital control, and computer averaging yielded a system that could follow 5 electrodes/sec with + or - .002 mv resolution and present a real time digital display. Dissert. Abstr.

N75-24381 Arizona State Univ., Tempe.
EFFICIENT SIMULATION OF A COMPUTER SYSTEM Ph.D. Thesis
David Charles Pheanis 1974 562 p
Avail: Univ. Microfilms Order No. 75-10050

Techniques were examined for simulating a computer system efficiently where the simulator's efficiency is measured in terms of user convenience, simulator speed, and system memory requirements. Specific methods for effective simulation were discovered and refined by actually developing an efficient simulator system and subjecting it to extensive use by student programmers. The fully-implemented system is presented in detail because it illustrates particular techniques that are applicable to simulator systems in general. The simulator program described runs on a UNIVAC 1110 computer, and simulates the DSL-620 computer system. For completeness a copiously-documented assembly-language listing of the entire simulator system is given in an appendix. Dissert. Abstr.

N75-24382*# Control Data Corp., Arden Hills, Minn. Aerospace Div.
STUDY OF THE MODIFICATIONS NEEDED FOR EFFICIENT OPERATION OF NASTRAN ON THE CONTROL DATA CORPORATION STAR-100 COMPUTER
[1975] 85 p refs Prepared for McDonnell-Douglas Astronaut. Co.
(Contract NAS1-12436)
(NASA-CR-132644) Avail: NTIS HC $4.75 CSCL 09B

NASA structural analysis (NASTRAN) computer program is operational on three series of third generation computers. The problem and difficulties involved in adapting NASTRAN to a fourth generation computer, namely, the Control Data STAR-100, are discussed. The salient features which distinguish Control Data STAR-100 from third generation computers are hardware vector processing capability and virtual memory. A feasible method is

presented for transferring NASTRAN to Control Data STAR-100 system while retaining much of the machine-independent code. Basic matrix operations are noted for optimization for vector processing. Author

N75-24383*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A DIGITAL ALGORITHM FOR SPECTRAL DECONVOLUTION WITH NOISE FILTERING AND PEAK PICKING: NOFIPP-DECON
Thomas R. Edwards, Gray L. Settle, and Randall D. Knight (Calif. Univ., Berkeley) Feb. 1975 41 p refs
(NASA-TM-X-64927) Avail: NTIS HC $3.75 CSCL 09B

Noise-filtering, peak-picking deconvolution software incorporates multiple convoluted convolute integers and multiparameter optimization pattern search. The two theories are described and three aspects of the software package are discussed in detail. Noise-filtering deconvolution was applied to a number of experimental cases ranging from noisy, nondispersive X-ray analyzer data to very noisy photoelectric polarimeter data. Comparisons were made with published infrared data, and a man-machine interactive language has evolved for assisting in very difficult cases. A modified version of the program is being used for routine preprocessing of mass spectral and gas chromatographic data. Author

N75-24384# Royal Aircraft Establishment, Farnborough (England).
EMPLOYMENT OF THE FAST FOURIER TRANSFORM IN DIGITAL FILTERS
W. Schaller Mar. 1975 22 p refs Transl. into ENGLISH from NTZ (West Ger.), v. 27, no. 11, 1974 p 425-431
(RAE-Lib-Trans-1834; BR47431) Avail: NTIS HC $3.25

The fast Fourier transform algorithm is discussed as a competitive solution to digital filtering in multiplex systems up to bandwidths of 10 MHz, expecially if a broad signal band is to be divided into many smaller channels. A general procedure, and a procedure appropriate for frequency division multiplex systems with equally spaced channels are presented. The economics of digital filter systems are compared with those of corresponding continuous filters. Author

N75-24385# California Univ., Livermore. Lawrence Livermore Lab.
MICROPROCESSORS IN COMPUTING
M. D. Maples 20 Nov. 1974 13 p refs Presented at CONPON Conf., San Francisco, 25 Feb. 1975 Sponsored by ERDA
(UCRL-76234; Conf-750206-2) Avail: NTIS HC $3.25

Two unusual applications of microcomputer applications are described: monitoring a tritium experiment in which mathematical computations are made, and calculating spectral data from a pulse-height analyzer. The mathematical program used by both experiments is a triple-precision, floating-point set of routines. These routines were developed by Recognition System as a double precision floating-point package but modified to triple precision. Author (NSA)

N75-24386# Illinois Univ., Urbana. Dept. of Computer Science.
USE OF MACROS IN BACKTRACK PROGRAMMING M.S. Thesis
James Richard Bitner Dec. 1974 38 p refs
(Grant NSF GJ-41538)
(PB-238644/9; UIUCDCS-R-74-687) Avail: NTIS HC $3.75 CSCL 09B

The use of macros and other heuristic techniques to increase the speed of backtrack programs is discussed. Detailed explanations of several macro programs are given for illustration. These techniques were successful in decreasing execution time by factors of 5 to 10 times over previous non-macro programs. GRA

N75-24387# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS Status Report, 1 Jan. - 30 Jun. 1973
Judith A. Clapp and Leonard J. LaPadula Jan. 1975 29 p refs 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007766; RADC-TR-74-325-Vol-1; MTR-2648-Vol-1) Avail: NTIS CSCL 09/2

The purpose of this effort was to investigate and develop techniques to reduce the procurement cost and increase the reliability and timeliness of complex computer software. Specific goals of the program were to study and define a Software-First Machine (SOFM), determine to what extent the technique of Structured Programming is beneficial in the testing of software and contributes to the reliability of software, and provide the Air Force with initial guideance in the area of software reliability. This report presents an overview of the technological background common to the six tasks of project 522A, a part of MITRE Project 5220. Besides discussing general background, this volume provides an introduction to each of the other seven volumes of the entire report. GRA

N75-24388# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS (EFFECTS OF MANAGEMENT PHILOSOPHY ON SOFTWARE PRODUCTION) Final Technical Report, 1 Jan. - 30 Jun. 1973
R. J. Fleischer Jan. 1975 16 p refs 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007767; MTR-2648-Vol-2; RADC-TR-74-325-Vol-2) Avail: NTIS CSCL 09/2

This paper examines, from a managerial viewpoint, the effects of programming group organization on both the people in the group and on the software thus produced. In particular, Weinberg's suggestions of egoless programming and democratic programing teams are discussed. GRA

N75-24389# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS (SOFTWARE FIRST CONCEPTS) Final Technical Report, 1 Jan. - 30 Jun. 1973
Richard H. Bullen, Jr. Jan. 1975 40 p refs 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007768; RADC-TR-74-325-Vol-3) Avail: NTIS CSCL 09/2

This report defines the problem addressed by software-first, and gives a definition of software-first as a design methodology for dealing with the interfaces among components in the design of complex systems. Hardware and software engineering technology which could support software-first design activities is reviewed. A final section addresses the role a software-first machine might play in Air Force systems development. GRA

N75-24390# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS (TOWARDS AN ANALYSIS OF THE LISP PROGRAMMING LANGUAGE) Final Technical Report, 1 Jan. - 30 Jun. 1973
C. Engleman Jan. 1975 122 p refs 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007769; MTR-2648-Vol-4; RADC-TR-74-325-Vol-4) Avail: NTIS CSCL 09/2

This report is concerned with the enormous productivity that has been an observed concomitant of LISP programming. Section I suggests a possible course of study directed towards defining the significance and bounds of applicability of a number of salient features of this language. Section II is a sample in-depth study, within the scheme of Section I, of a particular LISP feature, recursion. GRA

N75-24391# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS (MEASURING THE COMPLEXITY OF COMPUTER SOFTWARE) Final Technical Report, 1 Jan. - 30 Jun. 1973
J. E. Sullivan Jan. 1975 40 p refs 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007770; MTR-2648-Vol-5; RADC-TR-74-325-Vol-5) Avail: NTIS CSCL 09/2

This report presents several measures of computer program complexity, in the sense of comprehensibility or intellectual managability. The measures consider the program as an abstract process, and so are independent of programming language or implementation details. GRA

N75-24392# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS (SOME CASE STUDIES IN STRUCTURED PROGRAMMING) Final Technical Report, 1 Jan. - 30 Jun. 1973
L. L. Cheng Jan. 1975 79 p refs 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007771; MTR-2648-Vol-6; RADC-TR-74-325-Vol-6) Avail: NTIS CSCL 09/2

This paper explores the benefits of structured programming via two approaches. The first approach uses case studies of small problems to illustrate, in a qualitative way, the benefits as well as some problems associated with the application of these principles. The second approach presented in the Appendix, proposes a method for quantitatively measuring the effect of structured programming through controlled experiments. GRA

N75-24393# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS (A SOFTWARE ERROR CLASSIFICATION METHODOLOGY) Final Technical Report, 1 Jan. - 30 Jun. 1973
W. Amory and J. A. Clapp Jan. 1975 62 p 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007772; MTR-2648-Vol-7; RADC-TR-74-325-Vol-7) Avail: NTIS CSCL 09/2

This report presents preliminary results of a study in the area of error classification. A general method of error classification is described which is designed to serve as a guideline for experiment-specific application. A survey of error classification and analysis work, both in the general literature and at MITRE, as well as a study of error experiment design considerations, are reflected in the discussion and conclusions. GRA

N75-24394# Mitre Corp., Bedford, Mass.
ENGINEERING OF QUALITY SOFTWARE SYSTEMS (SOFTWARE RELIABILITY MODELING AND MEASUREMENT TECHNIQUES) Final Technical Report, 1 Jan. - 30 Jun. 1973
Leonard J. Lapadula Jan. 1975 81 p refs 8 Vol.
(Contract F19628-73-C-0001)
(AD-A007773; MTR2648-Vol-8; RADC-TR-74-325-Vol-8) Avail: NTIS CSCL 09/2

The results of a three-month investigation of software reliability modeling and measurement are reported herein. General discussions of software reliability and error and reliability estimation lead to a detailed description of six models and techniques. Also included are examples of the application of three of the models. Recommendations for work in FY74 conclude the report. GRA

N75-24395# Automatic Data Processing Equipment Selection Office (Navy), Washington, D.C.
COBOL COMPILER VALIDATION SYSTEM (1974) (X3.23-1974) ANS COBOL 1974. SEQUENTIAL I-O MODULE TEST SPECIFICATIONS Interim Report
28 Nov. 1974 50 p refs
(AD-A002973; USN-CCVS-74-Vol-04) Avail: NTIS CSCL 09/2

The Sequential I-O module provides the language features for processing magnetic tape files, sequential mass-storage files and files destined for printer output. The module is divided into two levels. The first level contains the basic language features for creating and processing files. The module contains the OPEN and CLOSE statements without any optional phrases, the WRITE statement excluding the END-OF-PAGE phrase, and the full READ and REWRITE facilities. The second level provides the full language capability for the processing of sequential files including extending a file, reading a file reversed, processing a tape containing multiple files, and sharing the same record area for two or more files. GRA

N75-24396# Braddock, Dunn and McDonald, Inc., Albuquerque, N.Mex.
TACOS 2 DOCUMENTATION. VOLUME 3D: TERAIN, PMAP, SORTEV USER/PLANNER MANUAL
May 1974 214 p
(Contract DAAH01-73-C-1150)
(AD-782158; BMD/A-16-74-R1) Avail: NTIS CSCL 15/3

Descriptions are presented of the TERAIN, PMAP, SORTEV, and TACOS computer programs which were compiled for used with aerial and ground-based defense systems. Computerized simulation and radar tracking are also discussed. Author

N75-24397# California Univ., Los Angeles. Dept. of Computer Science.
FAULT DETECTION THROUGH PARALLEL PROCESSING IN BOOLEAN ALGEBRA
Donnamaie E. White Mar. 1975 156 p refs
(Contract N00014-69-A-0200-4027; NR Proj. 084-129)
(AD-A007552; UCLA-ENG-7504) Avail: NTIS CSCL 09/2

This presentation is an overview of the research in progress on fault detection methods for circuits, both combinational circuits and sequential circuits. A summary of some of the existing techniques for minimal test set generation is followed by an introduction to the concept and theory of a minimal test sequence as a new approach for fault detection in combinational circuits. A detailed explanation of Triadic Graph Theory is followed by a summary of the existing techniques for parallel processing in Boolean algebra. The main contribution of this paper is the extension of the applications of the Boolean analyzer to the generation of: (1) Boolean differences; (2) stuck-at fault tests for a circuit (similar to those generated by Roth's D-algorithm); and (3) the test sequence(s) of a circuit. GRA

N75-24398# Stanford Univ., Calif. Dept. of Computer Science.
AUTOMATIC PROGRAM VERIFICATION 3: A METHODOLOGY FOR VERIFYING PROGRAMS
Friedrich W. V.Henke and David C. Luckham Dec. 1974 47 p refs
(Contract DAHC15-73-C-0435; ARPA Order 2494)
(AD-A007563; SU-STAN-CS-74-474; SU-AIM-256) Avail: NTIS CSCL 09/2

The paper investigates methods for applying an on-line interactive verification system designed to prove properties of PASCAL programs. The methodology is intended to provide techniques for developing a debugged and verified version starting from a program, that (a) is possibly unfinished in some respects, (b) may not satisfy the given specifications, e.g., may contain bugs, (c) may have incomplete documentation, (d) may be written in non-standard ways, e.g., may depend on user- defined data structures. The methodology involves (1) interactive application of a verification condition generator, an algebraic simplifier and a theorem-prover; (2) techniques for describing data structures, type constraints, and properties of programs and subprograms (i.e. lower level procedures); (3) the use of (abstract) data types in structuring programs and proofs. GRA

N75-24399# Stanford Univ., Calif. Systems Optimization Lab.
SOME EXPERIMENTS ON THE ACCURACY OF THREE METHODS OF UPDATING THE INVERSE IN THE SIMPLEX METHOD
P. F. McCoy and J. A. Tomlin Dec. 1974 31 p refs
(Contracts N00014-67-A-0112-0011; DAHC04-74-C-0034; NR Proj. 047-064)
(AD-A007148; SU-SOL-74-21; ARO-12215-5-M) Avail: NTIS CSCL 12/2

This note reports the results of some experiments on measuring the accuracy of a group of methods for updating the inverse in the simplex method. These methods are the standard product form, the Bartels-Golub method and the Forrest-Tomlin update. Then experiments, carried out on small to medium size models, were somewhat disturbing in that no method showed consistent superiority, and in that the error measurements that were used showed very erratic behavior. GRA

N75-24400# National Cancer Inst., Bethesda, Md. Lab. of Theoretical Biology.
SAAM25, SIMULATION, MODELING AND DATA FITTING PROGRAM. USER'S GUIDE
Mones Berman and Marjory F. Weiss Apr. 1974 132 p
(PB-238368/5; NIH/DF-74/004a) Avail: NTIS HC $5.75 CSCL 09B

SAAM is a digital computer program developed for the analysis of data in terms of models. It permits simulation and data fitting, and contains various techniques encountered in model

building. Although developed primarily for biological systems and more specifically for kinetic models, the program is of general utility. It differs from other simulation and data fitting programs in that its language is geared to the biomedical 'system' investigator and its elements and computational procedures are counterparts of conceptualizations and experimental methodologies employed by the investigator. Model building requires, knowledge of mathematical and statistical procedures and their limitations. GRA

N75-24401# Illinois Univ., Urbana. Dept. of Computer Science.
NOR NETWORK TRANSDUCTION PROCEDURES: MERGING OF GATES AND SUBSTITUTION OF GATES FOR FAN-IN AND FAN-OUT RESTRICTED NETWORKS (NETTRA-G3-FIFO AND NETTRA-PG1-FIFO)
Boonklee Plangsiri Dec. 1974 117 p refs
(Grant NSF GJ-40221)
(PB-238944/3; UIUCDCS-R-74-688) Avail: NTIS HC $5.25 CSCL 09B

This report presents two computer algorithms which can find minimal NOR(NAND) networks under fan-in and fan-out restrictions by using the concept of compatible set of permissible functions (CSF's). These two algorithms realize the network transduction procedures 'merging of gates' and substitution of gates', which are implemented into computer programs called 'NETTRA-G3-FIFO' and NETTRA-PG1-FIFO', respectively. Both programs have the capabilities in transforming a large nonoptimal NOR network under fan-in and fan-out restrictions into a near-optimal one by reducing the number of gates and connections. The results of the computer experiments on these two programs are included. GRA

N75-24402# Colorado Univ., Boulder. Dept. of Computer Science.
OPTIMAL SCHEDULING OF HOMOGENEOUS JOB SYSTEMS
Clarence A. Ellis Oct. 1974 56 p refs
(PB-238972/4; CU-CS-057-74) Avail: NTIS HC $4.25 CSCL 09B

Homogeneous job systems are systems in which all of a finite set of jobs to be processed by the system have exactly the same processing requirements. It was assumed that each job first executes an input tast requiring an input unit for some amount of time (T sub c) along with a memory unit. Then it executes a computational task requiring a processing unit and the memory for some amount of time (T sub p). Under these assumptions, it is possible to derive some inequalities concerning the relative number of memory, input, and processor units which can be efficiently used by the system as a function of (T sub c) and (T sub p). The scheduling problem is to order tasks and assign resources to them in such a way as to minimize some cost function. GRA

N75-24403# Chemical Abstracts Service, Columbus, Ohio.
APS-73 CROSS ASSEMBLER REFERENCE MANUAL
Apr. 1974 40 p
(Contract NSF C-656)
(PB-238821/3) HC $3.75 CSCL 09B

This manual provides basic information about the APS-73 ASSEMBLY SYSTEM and is intended as a reference manual for programmers. The APS-73 computer reference manual provides detailed information about the hardware characteristics of the APS-73 Computer. GRA

N75-24404# California Univ., Los Angeles.
PARAMETER IDENTIFICATION IN DISTRIBUTED SYSTEMS USING A DIGITAL SIMULATION LANGUAGE: USING EXTENSION OF PDEL M.S. Thesis
Chok Man Lam 1972 96 p refs
(PB-239431/0; W75-04540; OWRT-B-150-CAL(5)) Avail: NTIS HC $4.75 CSCL 09B

The capability of partial differential equation language (PDEL) is extended to handle the parameter identification problem. The following goals are accomplished: (1) a comparison of the existing parameter identification algorithms and the choosing of the most suitable one to be implemented into the existing PDEL system; and (2) the design and construction of a new portion of the parameter identification problems for those equations that can be solved by the existing PDEL system. The comparison study shows that the Fletcher-Powell method is the most suitable algorithm to be used because: its converge rate is reasonably fast; a large set of problems can be handled; and only minor changes to the existing PDEL system are required. GRA

N75-24405# California Univ., Los Angeles.
SOLUTION OF SIMULTANEOUS PARTIAL DIFFERENTIAL EQUATIONS: AN EXTENSION OF PDEL M.S. Thesis
Eileen Siu-ha Choi 1973 133 p refs
(PB-239432/8; W75-04539; OWRT-B-150-CAL(6)) Avail: NTIS HC $5.75 CSCL 09B

The capability of PDEL (partial differential equation language) is extended to solve simultaneous partial differential equations. Specifically, a new portion of the PDEL translator is designed to handle simultaneous 1-, 2-, and 3-dimensional elliptic, parabolic and hyperbolic equations and to actually implement the model for solving simultaneous 2-dimensional parabolic equations. The extension is accomplished by modifying the existing partial differential incorporation of an ordinary differential equation solution module rather than by implementing entirely new and lengthy algorithms to PDEL. GRA

N75-24406# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
A GENERALIZED INVERSION PROGRAM
Ed. R. Westwater and Otto Neal Strand Nov. 1974 37 p refs
(COM-75-50159/3; NOAA-TR-ERL-309; WPL-34; NOAA-75012402) Avail: NTIS MF $2.25; SOD HC as c55.13:ERL-309-WPL-34 CSCL 12A

A generalized inversion computer program is described for deriving a profile (i.e., a vector of functional values) from a finite set of imperfect measurements. The program assumes the observations are related to the profile by a nonlinear first kind operator equation. The method of solving the nonlinear equations is to iterate the solution of their linear approximation. Linear equations can be solved with this method in one iteration. The program described here uses either the Backus-Gilbert technique or the generalized Landweber inversion technique to solve the linear approximation at each stage of the iteration process. GRA

N75-24407# National Oceanic and Atmospheric Administration, Miami, Fla.
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABS (AOML) COMPUTER USERS GUIDE
Alan Herman Nov. 1974 97 p
(COM-75-10200/4; NOAA-TM-ERL-AOML-23; NOAA-75012403) Avail: NTIS HC $4.75 CSCL 09B

Control cards, nonstandard library routines, and a general operating system developed following conversion from Univac 1108 2 level 5 to level 6.2 are described. NSA

62 COMPUTER SYSTEMS

Includes computer networks.

N75-24408# Mitre Corp., McLean, Va.
DATA PROCESSOR SIZING FOR AN AERONAUTICAL SATELLITE COMMUNICATIONS CENTER (ASCC) Final Report
T. R. Mitchell Jan. 1975 96 p refs
(AD-A007624; FAA-EM-75-1; MTR-6789) Avail: NTIS HC $4.75 CSCL 09B

The size and cost of the data processing hardware and software that the U.S. ASCC will require is estimated. The computer programs which perform the functional processing are described, and a software operational concept is hypothesized. Computer speed, core, and disk requirements are derived for 100-aircraft and 540-aircraft system loadings. Software and hardware costs are presented. The sensitivity of the results are tested by a computer program developed to model ASCC software operations. Author

N75-24409# Brookhaven National Lab., Upton, N.Y.
BROOKNET: A HIGH SPEED COMPUTER NETWORK
G. H. Campbell, K. Fuchel, S. L. Padwa, and N. F. Schumberg Sep. 1974 6 p refs Presented at 3d Proc. of the Texas Conf. on Computing Systems, Austin, Tex., 7 Nov. 1974 Sponsored by ERDA
(BNL-19365; Conf-741140-1) Avail: NTIS HC $3.25

Brooknet is a digital communication network wherein a number of computers (currently 17) of different manufacture, are joined to a central facility consisting of two CDC 6600's and one million words of extended core storage. The links are over co-axial cable allowing a transmission rate of 12 megabits. Remote stations make use of this facility for remote job entry, data collection at the central end, and file management. The special hardware and re-entrant software are described, and figures given on system utilization, response times, overhead, and failure rates. Author (NSA)

N75-24410# California Univ., Los Angeles. Graduate School of Management.
DESCRIPTION OF COMPUTER NETWORK ANALYSIS MODEL
Bennet P. Lientz 12 Feb. 1975 15 p refs
(Contract N00014-75-C-0266; NR Proj. 049-345)
(AD-A007417; TR-2) Avail: NTIS CSCL 09/2

This report provides an overview of a computer based model for conducting analysis of computer networks. The intent of the model is to assist in planning and configuration design where large, detailed simulation models are costly and inappropriate. Author (GRA)

N75-24411# Research Inst. of National Defence, Stockholm (Sweden).
SEARCH SERVICE ON GOVERNMENT REPORTS ANNOUNCEMENTS (GRA) MAGNETIC TAPES AT THE SWEDISH NATIONAL DEFENCE RESEARCH INSTITUTE (FOA)
Wolfram Uhlmann Dec. 1974 53 p refs
(PB-238957/5; FOA-C10017-M7) Avail: NTIS HC $4.25 CSCL 05B

The report presents a comprehensive survey of the search service including a functional description of features of the CORSAIR and IRIS computer program complex relevant in this context. Practical details concerning technicalities of the search service in general and of search strategy and structuring are presented including data referring to performance, computer time, and computer cost. Auxiliary and supplementary functions of the search system are described. GRA

N75-24412# Illinois Univ., Urbana. Dept. of Computer Science.
DEADLOCK IN DISTRIBUTED COMPUTER NETWORKS
Thomas Jay Miller Dec. 1974 62 p refs
(Grants NSF DCR-72-03740-A1; NSF GJ-36265)
(PB-238943/5; UIUCDCS-R-74-619) Avail: NTIS HC $4.25 CSCL 09B

The theory of deadlock is studied to determine how centralized resource management algorithms may best be adapted for distributed control. The types of centralized resource management schemes known to date are examined. A distributed resource management scheme is proposed. When any process is allowed to execute system procedures to handle resource management, the main problem is one of synchronization. The author discusses how algorithms may be synchronized for distributed control and shows how to do so for an algorithm given in this report. Finally, the worst case performance and cost of the various types of distributed resource management are discussed as related to the algorithm employed for deadlock. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

N75-24413 Iowa Univ., Iowa City.
APPLICATION OF INTERNAL ANALYSIS TO PROBLEMS OF LINEAR CONTROL SYSTEMS Ph.D. Thesis
Edward Phillip Oppenheimer 1974 315 p
Avail: Univ. Microfilms Order No. 75-10498

The application was investigated of interval analysis techniques to the issue of computing machine intervals which bound the set of all solutions associated with initial-value problems of linear systems of autonomous first-order ordinary differential equations (that linearly depend on a parameter in an interval). Toward this goal, a metric space of continuous interval functions of an interval variable was constructed. Fast single-precision bounding interval arithmetic functions were devised and employed in the development of a linear interval integration algorithm. Algorithmic results were obtained within reasonable computing time for parameterized examples of an RLC circuit, a 4th-order servomechanism and a 5th-order minimum sensitivity optimal regulator design. Additionally, the bounding interval arithmetic was applied to two Kalman filter problems, empirically comparing contrasting computational forms for each algorithm. Dissert. Abstr.

N75-24414 Michigan Univ., Ann Arbor.
GLOBAL OPTIMALITY CONDITIONS AND THE DARBOUX POINT Ph.D. Thesis
Pierre Maurice Mereau 1974 176 p
Avail: Univ. Microfilms Order No. 75-10232

Two different approaches to global optimality in optimal control theory are considered. The first approach involves the relaxation of existing sufficient conditions expressed in terms of inequalities between the functions involved in the definition of the problem. The second approach considered relies upon the concept of a Darboux point. A formal definition of a Darboux point was proposed and several theorems concerning its existence were proved. A distinction between type-1 Darboux points indicating only the loss of global optimality of a trajectory and type-2 Darboux points indicating also the loss of the existence of a solution to the problem was made. A method to characterize Darboux points was proposed, and it is proved that for problems with linear dynamics, quadratic cost functional, and analytic terminal state constraints, the Darboux point is equal to the supremum of a sequence of conjugate points of a particular family of linear quadratic problems. Dissert. Abstr.

N75-24415# Texas Univ., El Paso. Dept. of Electrical Engineering.
PULSE DOPPLER AMBIGUITY RESOLUTION
Fred J. Taylor 1974 82 p refs
(Contract DAHC04-72-A-0001)
(AD-A007416) Avail: NTIS CSCL 12/1

The author of this note has been involved with the analysis of existing and future pulse Doppler ambiguity resolution methods. The existing pulse Doppler ambiguity resolution technique is supplied by R.C.A. and a future algorithm is presented by the author. The existing R.C.A. ambiguity resolution method has been tested and found to perform satisfactorily when the received data is scintillation free. These noise bursts produce extremely large estimation errors and poor convergence properties, this is due to their algorithm minimizing only range error, with a fixed time-invariant weight (namely the number 1). The new algorithm using Kalman filter produces superior results. It embodies the simultaneous minimization of both range and range-rate errors and uses optimal time varying weights, namely covariance information. GRA

N75-24416# Naval Postgraduate School, Monterey, Calif.
OPTIMAL SYNTHESIS PROGRAM FOR AUTOMATIC CONTROL (OSPAC) Technical Report, Mar. 1974 - Feb. 1975
Ronald A. Hess and James W. Sturges Feb. 1975 59 p
(AD-A007550; NPS-57HE75021; TR-19) Avail: NTIS CSCL 12/1

A digital computer program written in FORTRAN 4 is presented which solves the stationary linear quadratic Gaussian optimal control problem. Detailed instructions on the use of the program as well as an illustrative example are presented. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-24417 North Carolina State Univ., Raleigh.
AN ACCELERATED ELIMINATION TECHNIQUE FOR THE SOLUTION OF PERTURBED HAMILTONIAN SYSTEMS Ph.D. Thesis
Robert Alden Howland, Jr. 1974 121 p
Avail: Univ. Microfilms Order No. 75-10407

A new transformation technique was developed for the solution of perturbed Hamiltonian systems periodic in the momenta through systematic elimination of the momenta. The technique was applied to a simple example, yielding a complete solution through fifth order in the perturbation parameter. Partial solutions using the classical (von Zeipel) technique and Deprit's Lie transform algorithm were obtained, forming a basis for subsequent comparison of these methods with the new one. Application of the technique to physical systems is exemplified by consideration of Duffing's equation (nondegenerate) and the main problem of lunar theory (degenerate), for which transformed Hamiltonians are obtained through third and fourth order respectively, exhibiting the method's accelerated elimination.
Dissert. Abstr.

N75-24418 Illinois Univ., Urbana.
CONTROL OF MIXED DISTRIBUTED AND LUMPED PARAMETER SYSTEMS Ph.D. Thesis
Arild Thowsen 1974 114 p
Avail: Univ. Microfilms Order No. 75-11699

Optimal control, observability, and controllability of linear systems governed by simultaneous sets of ordinary and partial differential equations were investigated. The interaction on the spatial boundary between the lumped and the distributed subsystems provides a convenient criterion for their classification. Three common types of mixed distributed and lumped parameter systems were identified, and practical examples are referenced. Optimal sampled-data control of mixed systems was studied. The performance index is a general quadratic form which allows regulation of both the distributed and lumped parts of the system, and the feedback control laws are linear functions of the distributed and lumped states. A set of recursive matrix equations determines the optimal feedback gains. Under conditions of controllability, time-invariance and infinite time horizon, the gains are shown to be independent of time.
Dissert. Abstr.

N75-24419*# TRW Systems Group, Redondo Beach, Calif.
SOME SELF STARTING INTEGRATORS FOR x PRIME EQUALS f (x, t)
Wm. M. Lear 27 Nov. 1974 73 p ref
(Contract NAS9-14330)
(NASA-CR-141784; MSC-14802; TRW-27054-6005-TU-00) Avail: NTIS HC $4.25 CSCL 12A

The integration is discussed of the vector differential equation X = F(x, t) from time t sub i to t sub (i = 1) where only the values of x sub i are available for the the integration. No previous values of x or x prime are used. Using an orbit integration problem, comparisons are made between Taylor series integrators and various types and orders of Runge-Kutta integrators. A fourth order Runge-Kutta type integrator for orbital work is presented, and approximate (there may be no exact) fifth order Runge-Kutta integrators are discussed. Also discussed and compared is a self starting integrator ising delta f/delta x. A numerical method for controlling the accuracy of integration is given, and the special equations for accurately integrating accelerometer data are shown.
Author

N75-24420# Sandia Labs., Albuquerque, N.Mex.
COMPUTATIONAL TECHNIQUES FOR BOUNDARY LAYERS
F. G. Blottner 1974 51 p refs Presented at course in Computational Fluid Dyn., Brussels, 17 Feb. 1975 Sponsored by ERDA
(SAND-74-5821; Conf-750207-1) Avail: NTIS HC $4.25

The present status of the numerical computation of boundary layers is given for two- and three-dimensional flows. The appropriate transformations to apply to the governing equations are considered, and the possible solution procedures are discussed. The finite difference procedures are illustrated for the two-dimensional, incompressible flows. For compressible flows the Crank-Nicolson technique is given. The changes that are needed to this approach, when the flow is turbulent, are presented. The finite difference procedures utilized for unsteady flows are given. Solution techniques for three-dimensional flows are described and the features that are different from two-dimensional flows are emphasized.
Author (NSA)

N75-24421# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
METHODS FOR COMPUTING AND MODIFYING THE LDV FACTORS OF A MATRIX
Philip E. Gill, Walter Murray, and Michael Saunders, A. (Dept. of Sci. and Ind. Res., Wellington, New Zealand) Sep. 1974 50 p refs
(NPL-NAC-56) Avail: NTIS HC $3.75

Methods are given for computing the LDV factorization of a matrix B and modifying the factorization when columns of B are added or deleted. The methods may be viewed as a means for updating the orthogonal (LQ) factorization of B without the use of square roots. It is also shown how these techniques lead to two numerically stable methods for updating the Cholesky factorization of a matrix following the addition or subtraction (respectively) of a matrix of rank one.
Author (ESRO)

N75-24422# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Metallique.
A FINITE ELEMENT ANALYSIS OF BODIES OF REVOLUTION. A COMPARISON BETWEEN CURRENTLY USED TYPES OF ELEMENTS
Rudy Beeckman and Daniel vanLeeuwen (Ghent Univ.) Dec. 1974 56 p refs
(CRIF-MT-102) HC $4.25

Three types of elements used in the stress analysis of bodies of revolution are reviewed. The details of calculations with regard to stiffness and stress matrices, force integrals, and the relationship between the displacement field and degrees of freedom are evaluated. Several theoretical examples and practical applications to pressure vessel constructions are treated.
Author (ESRO)

N75-24423# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE APPROXIMATION OF CORRELATION FUNCTIONS
M. M. Medvedev 24 Jan. 1975 24 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 4, 1971 p 147-151
(AD-A007664; FTD-MT-24-478-75) Avail: NTIS CSCL 12/1

The approximation method of correlation functions by using generalized Fourier series in Laquerre functions was investigated. The combination of natural criterion for approximation and optimum selection of scale makes it possible to construct approximating polynomial with the smallest amount of terms. Other topics discussed include root-mean-square errors, ergodic random processes, and spectral functions.
M.J.S.

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

No abstracts in this category.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-24424 Michigan Univ., Ann Arbor.
LOAD SHARING IN COMPUTER NETWORKS: A QUEUEING MODEL Ph.D. Thesis
Carl Edward Landwehr 1974 209 p
Avail: Univ. Microfilms Order No. 75-10211

The conditions under which load sharing of batch jobs in a computer network is feasible were investigated. The approach taken is synthetic: a queueing model for a single host system is defined and analyzed, and this model forms the basis for models of a network of several hosts connected by telecommunications facilities. Parameter studies of the models constructed indicate that under conditions observed in present-day computer systems, load sharing can be a useful technique. The strongest incentive for load sharing is a significant difference in resource costs or computing loads at different subsystems; however, even the case of two lightly loaded hosts appears to benefit from a network if arrival rates at the two systems differ widely. In addition, load sharing is observed to decrease fluctuations in mean waiting time when computing demand varies widely. The model for a single host system is Markovian and includes two queues -- one potentially infinite queue for batch jobs and a finite capacity queue for terminal jobs. Dissert. Abstr.

N75-24425# Battelle-Northwest, Richland, Wash.
APPLIED SYSTEMS ECOLOGY: MODELS, DATA, AND STATISTICAL METHODS
L. L. Eberhardt 1974 43 p refs Presented at Conf. on Systems Ecology, Logan, Utah, 20 Feb. 1975
(Contract AT(45-1)-1830)
(BNWL-SA-5216; Conf-750202-1) Avail: NTIS HC $3.75

Applications of systems analysis techniques, including biological models, mathematical models, statistical methods, and computer analysis of data are discussed. NSA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N75-24426# Maryland Univ., College Park. Computer Science Center.
A NOTE ON IRREDUCIBILITY FOR LINEAR OPERATORS ON PARTIALLY ORDERED FINITE DIMENSIONAL VECTOR SPACES
James S. Vandergraft Jan. 1974 13 p refs
(Grant NSF GJ-35568)
(PB-239382/5; TR-350; NSF-OCA-GJ35568X-350) Avail: NTIS HC $3.25 CSCL 12A

Many of the important applications of the Perron-Frobenius theory of non-negative matrices assume that certain matrices are irreducible. The purpose of this note is to introduce a weaker condition which can be used in place of irreducibility, even in the more general setting of linear operators on a partially ordered finite dimensional vector space. Applications to convergence theorems, comparison results, and generalized diagonal dominance conditions are given. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-24427 Ohio State Univ., Columbus.
FINITE DIFFERENCE METHODS FOR TRANSIENT SIGNAL PROPAGATION IN STRATIFIED DISPERSIVE MEDIA Ph.D. Thesis
Dong Hoa Lam 1974 107 p
Avail: Univ. Microfilms Order No. 75-11382

Explicit difference equations are presented for the solution of a signal of arbitrary waveform propagating in an ohmic dielectric, a cold plasma, a Debye model dielectric, and a Lorentz model dielectric. These difference equations are derived from the governing time-dependent integro-differential equations for the electric fields by a finite difference method. A special difference equation is derived for the grid point at the boundary of two different media. Employing this difference equation, transient signal propagation in an inhomogeneous medium can be solved provided that the medium is approximated in a step-wise fashion. The solutions are generated simply by marching on in time. By appropriate choice of the time and space intervals, numerical stability and convergence are always obtained. Numerous examples are given to demonstrate the wide range of applicability of the difference solution. Dissert. Abstr.

N75-24428 Purdue Univ., Lafayette, Ind.
NONLINEAR WAVE PROPAGATION IN HETEROGENEOUS ANISOTROPIC PLATES Ph.D. Thesis
Naim Abdel-hady Shafey 1974 155 p
Avail: Univ. Microfilms Order No. 75-10962

Nonlinear wave propagation in laminated plates of fiber-reinforced composites is discussed. Free waves, shock waves, and acceleration waves were investigated along with the effects of geometrical and physical nonlinearities. Equations of motion for large amplitude free waves as well as for incremental deformations superposed on large deflection are derived. It is found that a train which consists of a finite number of free harmonic waves can propagate with large amplitudes or with small amplitudes imposed on large initial deflection, and that the shear wave velocity increases as a result of the large amplitude or as a result of the large initial deflection. The equations governing the propagation of shock waves and acceleration waves at large amplitude are derived, and it is found that the shear wave front is considerably affected by the wave amplitude. It is found that the bending and twisting moment modes are affected by the geometrical nonlinearity only through the coupling terms which vanish for symmetric laminates, and that the amplitude of the shear strain has the effect of increasing or decreasing the wave velocity for hardening or softening type materials respectively. Dissert. Abstr.

N75-24429 Illinois Univ., Urbana.
APPLICATION OF COMPLEX RAY TRACING TO THE SCATTERING OF AN EVANESCENT PLANE WAVE BY A CONDUCTING CIRCULAR CYLINDER Ph.D. Thesis
Wei-Yi David Wang 1974 78 p
Avail: Univ. Microfilms Order No. 75-11700

Representations and geometric constructions associated with complex rays are presented. The scattering problem of an evanescent plane wave by a conducting circular cylinder is easily solved by the use of a complex ray tracing method. The exact solution to this problem is given to check the validity of the approximation resulting from complex ray tracing. The transformation, which associates to every complex reflection point a real observation point where the reflected ray intersects the real space, is considered and analyzed. It is used to derive the reflected field in amplitude and phase, and also leads to a very simple expression for the scattered far field. Phase paths are extensively studied and can be easily constructed through the use of the transformation. Tentative selection and truncation rules are used which yield branches of the phase paths and of the field that agrees, at least in some regions, with the exact solution.
Dissert. Abstr.

N75-24430*# Kanner (Leo) Associates, Redwood City, Calif.
ON THE GENERALIZATION OF KIRCHHOFF FORMULA
S. L. Sobolev Washington NASA May 1975 12 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), no. 6, 1933 p 256-262
(Contract NASw-2481)
(NASA-TT-F-16332) Avail: NTIS HC $3.25 CSCL 20N

A solution of the wave equation in the space $R(2k+1)$, with an odd number of dimensions, is presented by means of elementary reasoning. The solution is a generalization of the Kirchhoff formula. A general solution of the Cauchy Problem is deduced from this formula, in a manner similar to that used in the case of three dimensions. This method can also be extended to the wave equation in a heterogeneous medium. Author

N75-24431# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.
ELECTROMAGNETIC FIELDS GENERATED BY TURBULENT

AIR FLOW AND SHOCK WAVES
James Clark Jan. 1975 34 p refs
(WTHD-68) Avail: NTIS HC $3.75

Electromagnetic fields generated by the acceleration of aligned polar molecules in turbulent air vortices were studied. A range of frequencies from 25 Hz to 40,000 Hz were observed. A new instrument known as the electronic probe was designed and developed to pick up these fields by induction in the near zone of propagation. An excellent cross-correlation was obtained between hot-wire anemometer and electronic probe signals recorded simultaneously at the same test point when analyzed with a correlation and probability analyzer. Tests indicate that this new probe may be used to measure aerodynamic shear directly in turbulent flow. The results of some initial studies of these induction fields emitted from both subsonic and supersonic airflow were presented and the instrumentation is briefly described. Author

N75-24432# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
LOW TEMPERATURE MAGNETIZATION FOR HEISENBERG FERROMAGNET
N. M. Plakida and P. R. Rusek 1974 11 p refs In RUSSIAN
(JINR-P4-8032) Avail: ERDA Depository Libraries HC $4.00

Low temperature magnetization for the Heisenberg ferromagnet with spin 1/2 is obtained by the method of the irreducible Green function, which has no unphysical T3 term in accordance with Dyson expansion. Author (NSA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution.*

N75-24433 Arizona Univ., Tucson.
REAL-TIME WAVEFRONT CORRECTION THROUGH BRAGG DIFFRACTION OF LIGHT BY SOUND WAVES Ph.D. Thesis
Virendra Nath Mahajan 1974 130 p
Avail: Univ. Microfilms Order No. 75-11062

The index variation, or wave, produced by a sound wave traveling in a liquid was obtained from the Lorentz-Lorenz equation, and in a solid, it was obtained by considering the photoelastic effect on the solid's index ellipsoid. The index waves produced by two orthogonal sound waves were obtained. It is shown that a sound wave of low frequency and narrow width behaves as an optical phase grating (Raman-Nath diffraction). If the frequency and width of the sound wave are increased sufficiently, all diffraction effects generally disappear due to the destructive interference of the diffracted waves generated at different points of an acoustic wave front. Diffraction of light by a sound wave is also considered in terms of a photon-phonon interaction, and the frequency and wave vector shifts are explained in terms of energy and momentum conservation. A partial wave analysis of diffraction of light by a sound wave, based on the optical wave equation for the acousto-optic medium is given. Successive Bragg diffraction of light by two sound waves of the same frequency but different wavelengths propagating in approximately parallel directions is described. Dissert. Abstr.

N75-24434# Naval Research Lab., Washington, D.C.
NONLINEAR ACOUSTICS. PART 1: PHYSICAL PHENOMENA, EXACT BASIC EQUATIONS, AND PROBLEMS IN FORMULATION AND SOLUTION OF APPROXIMATE EQUATIONS Interim Report
Sam Hanish 10 Dec. 1974 152 p refs
(AD-A002997; NRL-7772-Pt-1) Avail: NTIS CSCL 20/1

The basic equations of classical hydrodynamics of fluids, together with constitutive relations of the medium, have been reviewed. By perturbation expansions the nonlinear equations of acoustic wave propagation currently in use were derived using the acoustic Mach number and Strouhal number as measures of scale (method of Goldberg). Several derivations of Burgers'-type equations have been presented, together with a review of solution methods introduced by Hopf and Cole and of the method of characteristics. The classic problem of a piston in a tube was reviewed, with the theoretical extensions of Blackstock. The complexity of all methods led to a search for new approaches. A promising development is Whitham's theory of nonlinear partial differential equations. Elements of this theory are discussed. It is concluded that theoretical difficulties in nonlinear acoustics remain to be solved. GRA

N75-24435# Ferson Optics, Ocean Springs, Miss.
ACOUSTIC LENS DESIGN
17 Sep. 1974 30 p
(Contract N61331-74-C-0032)
(AD-A007847) Avail: NTIS CSCL 20/1

The purpose of this study is to work on five separate Acoustic Lens Designs. The performance of each is either diffraction limited or near diffraction limited. GRA

N75-24436# Wiggins (J. H.) Co., Redondo Beach, Calif.
SOUND AND VIBRATION MEASUREMENTS FOR CONCORDE SUPERSONIC TRANSPORT AND SUBSONIC JET AIRCRAFT Final Report, Jan. - Jul. 1974
John H. Wiggins 31 Jul. 1974 118 p refs
(Contract DOT-OS-40121)
(PB-238748/8; DOT-TST-75-21) Avail: NTIS HC $5.25 CSCL 20A

Sound and structural vibration levels resulting from operations of both supersonic (SST) and conventional subsonic jet aircraft are analyzed. The study first analyzes the potential differences in noisiness between SST and conventional aircraft, knowing only the sound pressure spectra. Next, results of monitored SST and conventional aircraft flights conducted at Fairbanks, Alaska, International Airport on February 11-15, 1974, are reported. These results test the hypothesis put forth in the analytical portion of the report. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-24437 Pennsylvania State Univ., University Park.
AN INVESTIGATION OF THE ENERGY-MOMENTUM RELATIONS FOR THE PIEZOELECTRIC POLARON Ph.D. Thesis
John A. Thomchick 1974 129 p
Avail: Univ. Microfilms Order No. 75-9852

The energy-momentum relation which is believed to be correct starts out quadratic for small total momentum but for large total momentum asymptotes to a straight line with slope equal to the speed of sound. This type of behavior is found in both the weak coupling Lee-Low-Pines theory and in a version of strong coupling theory appropriate for a moving polaron. Wave functions in the Lee-Low-Pines and strong coupling theories are studied. It is shown that the states represented by these wave functions are such that the electron is clothed by its concomitant lattice distortion even as the polaron velocity approaches the speed of sound. The lattice distortion becomes larger in this limit. It is also shown that the constant potential surfaces around the electron flatten in the direction of the polaron velocity. A lower bound to this Hamiltonian is calculated. Dissert. Abstr.

N75-24438*# Nebraska Univ., Lincoln. Behlen Lab. of Physics.
VIBRATIONAL INTENSITY DISTRIBUTIONS FOR CONTINUUM PHOTOIONIZATION OF OXYGEN
J. L. Gardner and James A. R. Samson [1975] 5 p refs
Sponsored in part by NSF
(Grant NGR-28-004-021)
(NASA-CR-142748) Avail: NTIS HC $3.25 CSCL 20H

Experimental vibrational intensity distributions for continuum photoionization of oxygen using both the 584 A and 304 A helium lines are reported. The photoionization cross section of oxygen shows a substantial dip in magnitude over a 20 A band centered about 590 A; thus the possibility exists that the

584 A photoelectron spectrum of oxygen includes an autoionized contribution and, consequently, the vibrational intensity distributions may not correspond to those of continuum ionization. The oxygen photoionization cross section shows no structure around 304 A and purely continuum ionization is expected. Photoelectron spectra were recorded at a resolution of 45 meV with dispersed He radiation, using a cylindrical mirror energy analyzer with known transmission properties. Author

N75-24439*# Alabama A & M Univ., Normal. Dept. of Physics and Mathematics.
DIFFERENCE EQUATION FOR SUPERRADIANCE
C. T. Lee [1974] 10 p refs
(Grant NsG-8011)
(NASA-CR-142875) Avail: NTIS HC $3.25 CSCL 20H

The evolution of a completely excited system of N two-level atoms, distributed over a large region and interacting with all modes of radiation field, is studied. The distinction between r-conserving (RC) and r-nonconserving (RNC) processes is emphasized. Considering the number of photons emitted as the discrete independent variable, the evolution is described by a partial difference equation. Numerical solution of this equation shows the transition from RNC dominance at the beginning to RC dominance later. This is also a transition from incoherent to coherent emission of radiation. Author

N75-24440*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BEHAVIOR OF ATOMIC H IN SOLID H2 FROM 0.2 TO 0.8 K
R. W. H. Webeler 1975 6 p refs Presented at the Meeting of the Amer. Phys. Soc., Washington, D. C., 28 Apr. - 1 May 1975
(NASA-TM-X-71732; E-8360) Avail: NTIS HC $3.25 CSCL 07D

A mixture of hydrogen with 0.03 percent tritium was liquefied and then solidified to produce H radicals in a crystalline solid H2 matrix below 1.0 K. Temperature dependent stored energy releases were triggered at various temperatures below 0.8 K with and without a 3-teslafield. From sample susceptibility measurements near 0.33 K and other considerations it was surmized that there exists cooperative interactions and that localized regions of higher H concentrations may behave as ferromagnetic domains. Author

N75-24441*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
STUDY OF THE REACTION OF ATOMIC OXYGEN WITH AEROSOLS Final Report
Francis I. Akers and James P. Wightman Washington NASA May 1975 111 p refs
(Contract NAS1-10646)
(NASA-CR-2529) Avail: NTIS HC $5.25 CSCL 07D

The rate of disappearance of atomic oxygen was measured at several pressures in a fast flow pyrex reactor system with its walls treated with (NH4)2SO4 (s), H2SO4 (l), and NH4CL (s). Atomic oxygen, P-3 was generated by dissociation of pure, low pressure oxygen in a microwave discharge. Concentrations of atomic oxygen were measured at several stations in the reactor system using chemiluminescent titration with NO2. Recombination efficiencies calculated from experimentally determined wall recombination rate constants are in good agreement with reported values for clean Pyrex and an H2SO4 coated wall. The recombination efficiency for (NH4)2SO4, results in a slightly lower value than for H2SO4. A rapid exothermic reaction between atomic oxygen and the NH4Cl wall coating prevented recombination efficiency determination for this coating. The results show that the technique is highly useful for wall recombination measurements and as a means of extrapolating to the case of free stream aerosol-gas interactions. Author

N75-24442# Brookhaven National Lab., Upton, N.Y.
FEASIBILITY STUDIES ON THE RADIOCHEMICAL LITHIUM SOLAR NEUTRINO EXPERIMENT
J. K. Rowley 1974 15 p refs Presented at Conf. on Particle Acceleration and Nucl. Reaction in Space, Leningrad, 19-21 Aug. 1974 Sponsored by ERDA
(BNL-19300; Conf-740851-2) Avail: NTIS HC $3.25

Progress was made on the separation of the product, Be-7, from the target, a 12 M LiCl solution in water. Experimental studies of several suitable efficient methods for achieving this separation are discussed. Possible methods for counting Be-7 are listed, and the results of some preliminary investigations of some of these methods are reported. Moderate success in Geiger counting Be-7 in the gas phase was achieved. Background processes which can also produce Be-7 are also listed, and the estimated backgrounds due to these processes are reported. Author (NSA)

N75-24443# California Univ., Livermore. Lawrence Livermore Lab.
DT FUSION NEUTRON IRRADIATION OF ORNL MAGNESIUM OXIDE CRYSTAL, BPNL MOLYBDENUM, LLL COPPER TENSILE SPECIMENS, LLL MACHINABLE GLASS CERAMIC, AND UW/LLL HIGH PURITY METALLIC FOILS
S. C. MacLean 18 Dec. 1974 7 p
(Contract W-7405-eng-48)
(UCID-16665) Avail: NTIS HC $3.25

The requests for the irradiations in the LLL rotating target neutron source are described. The order of stacking in the metallic foils is listed. Irradiation was carried out from Nov. 7 to 13, 1974, and the average fluences from the dosimetry foils are given. NSA

N75-24444# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
MICROWAVE TRANSIENT RESPONSE MEASUREMENTS OF ELASTIC MOMENTUM TRANSFER COLLISION FREQUENCY
D. A. McPherson, R. K. Feeney, and J. W. Hooper 1 Dec. 1974 137 p refs
(Contract AT(40-1)-3027)
(ORO-3027-26) Avail: NTIS

An experimental facility and the associated technique were developed for the microwave transient response measurement of the elastic momentum transfer collision frequency of electrons in gases. The apparatus and methods were applied to the determination of the electron collision frequency in argon gas as a function of electron energy in the energy range from 0.08 eV to 4 eV. This research represents the first successful measurement of the electron collision frequency in argon near the Ramsauer minimum using the microwave transient response technique. Author (NSA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N75-24445*# Fisk Univ., Nashville, Tenn. Dept. of Physics.
PROPERTIES OF SCATTERING AMPLITUDES AT VERY HIGH ENERGIES Final Technical Report, 1 Jun. 1974 - 1 Jun. 1975
Ronald Elbert Mickens 1 Jun. 1975 5 p refs
(Grant NsG-8007)
(NASA-CR-142762) Avail: NTIS HC $3.25 CSCL 20H

The research is reported concerning the (1) total cross sections as the energy becomes infinite, (2) elastic scattering amplitude for nonforward directions, and (3) upper bound of neutrino scattering cross sections. F.O.S.

N75-24446*# Kanner (Leo) Associates, Redwood City, Calif.
ORGANIC ANALYSIS BY NUCLEAR MAGNETIC RESONANCE
C. Trogolo Washington NASA Apr. 1975 14 p Transl. into ENGLISH from Rev. Combust. (Italy), v. 25, 1971 p 502-508
(Contract NASw-2481)
(NASA-TT-F-16276) Avail: NTIS HC $3.25 CSCL 20H

The phenomenon of nuclear magnetic resonance (NMR) is explained, and the use of NMR spectra in the analysis of organic compounds is discussed. It is shown that the highest potential

of NMR spectrometry is in the structural analysis of pure organic compounds; it can also be used to advantage in petroleum chemistry. Other applications of NMR spectrometry are included. Author

N75-24447# Grenoble Univ. (France). Inst. des Sciences Nucleaires.
MANUAL FOR THE USE OF PARTICLE TRAJECTORIES PROGRAMS TO FIRST ORDER OF THE OPTIC SERIES
J. Ferme 15 May 1974 70 p refs In FRENCH; ENGLISH summary
(ISN-74-12) Avail: NTIS HC $4.25

The OPTIC series programs have been used to calculate, to the first order, particle trajectories in optical systems composed of dipole and quadrupole magnets. These programs are adapted for use on a PDP 9 or PDP 15 computer with input/output by teletype. Author (NSA)

N75-24448# Stanford Linear Accelerator Center, Calif.
PROCEEDINGS OF THE 9TH INTERNATIONAL CONFERENCE ON HIGH ENERGY ACCELERATORS
1974 786 p refs Conf. held at Stanford, Calif., 2-7 May 1974 Sponsored by ERDA, NSF and Intern. Union of Pure and Appl. Phys.
(Conf-740522) Avail: NTIS HC $17.25

Papers on accelerators, storage rings, beam dynamics, superconductivity, and superconducting magnets are presented. J.M.S.

N75-24449# Purdue Univ., Lafayette, Ind.
STUDIES OF THE EFFECTS OF RADIATIONS Final Report
J. W. MacKay 14 Jun. 1974 11 p refs
(Contract AT(11-1)-125)
(COO-125-57) Avail: NTIS HC $3.25

Research results are reported on radiation effects on Ge, annealing of Ge, stored energy release in Ge, electric conductivity of Ge, Si lattice parameters, and radiation effects on Si. NSA

N75-24450# Argonne National Lab., Ill.
NEUTRON SCATTERING AND MAGNETIZATION MEASUREMENTS ON THE KONDO COMPOUND CeAl3
A. S. Edelstein, T. O. Brun, G. H. Lander, O. D. McMasters, and K. A. Gschneidner, Jr. 1974 17 p refs Presented at 20th Ann. Conf. on Magnetism and Magnetic Materials, San Francisco, 3 Dec. 1974
(Conf-741202-13) Avail: NTIS HC $3.25

Previous measurements on the Kondo compound, CeAl3 (hexagonal DO19), indicate that with decreasing temperature it transforms gradually into a singlet state and does not magnetically order above 0.6 K. To determine the spatial extent of the magnetic moment,the spin-dependent cross section of neutrons diffracted from the (201) planes of a polycrystalline sample in 50 kOe at 5, 19, and 81 K was measured. At 50 kOe and these temperatures, the total moment from magnetization measurements on the same sample is only 5 to 15% lower than the moment determined by the neutrons if one assumes a 4f form factor. This approximate agreement supports the hypothesis that the moment decreases without changing its spatial distribution. A similar spatially uniform reduction of the moment occurs also in dilute Kondo systems. From the field dependence of the magnetization M, the characteristic or kondo temperature is estimated to be 13 K. Author (NSA)

N75-24451# California Univ., Berkeley. Lawrence Berkeley Lab.
ROTATING, CHARGED OR GRAVITATING LIQUID DROP, AND PROBLEMS IN NUCLEAR PHYSICS AND ASTRONOMY
W. J. Swiatecki Aug. 1974 29 p refs Presented at Intern. Colloq. on Drops and Bubbles, Pasadena, Calif., 28 Aug. 1974
(Contract W-7405-eng-48)
(LBL-3363; Conf-740837-4) Avail: NTIS HC $3.75

A survey is presented of the equilibrium configurations of a rotating charged or gravitating liquid mass in a way that unifies the treatment of idealized rotating heavenly bodies, rotating drops in a weighless environment, and idealized rotating nuclei. A number of applications, especially to nuclear physics, is described. NSA

N75-24452# California Univ., Livermore. Lawrence Livermore Lab.
PROJECT RIO BLANCO: PROJECT SCIENTIST'S SUMMARY REPORT OF PRODUCTION TEST DATA AND PRELIMINARY ANALYSIS OF TOP CHIMNEY/CAVITY
J. Toman Nov. 1974 33 p refs Presented at the 4th IAEA Panel on Peaceful Nuclear Explosive, Vienna, 20 Jan. 1975 Sponsored by ERDA
(UCRL-76280; Conf-750109-6) Avail: NTIS HC $3.75

The reentry drilling established communication with the top Rio Blanco detonation region at a depth of 1704 m, or about 76 m above the top detonation center. A total of 2,800, 000 cu m dry gas at standard conditions was produced during two separate test periods. Radiocative and chemical analysis of the following main results: no permeable connection exists between the top and the middle detonation regions, since none of the tracer incorporated in the center explosive canister was detected in the produced gas. As a consequence, results for the top detonation region only are available at this time. Author (NSA)

N75-24453# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
CONTROLLABILITY OF A STEADY-STATE TOKAMAK FUSION REACTOR
Z. A. Sabri and A. A. Husseiny Sep. 1974 4 p refs Presented at the Am. Nuclear Soc. National Meeting, Washington, 27 Oct. 1974 Sponsored by ERDA
(Conf-741086-9) Avail: NTIS HC $3.25

The controllability of a steady-state fusion reactor by variations in the tritium enrichment, the injection rate, and the leakage rate of the fuel was examined. Changes in the tritium enrichment are assumed to be achieved by proper control of the fuel composition during injection but independent of other control modes. Variation in the leakage rate can be done through the control of magnetic fields. NSA

N75-24454# Battelle-Northwest, Richland, Wash.
[RESEARCH ON Sr HEAT SOURCE AND COMPATIBILITY TESTS, DISSOLUTION RATE, AND PROPERTY MEASUREMENTS OF SrF2] Quarterly Report, Jul. - Sep. 1974
H. T. Fullam Oct. 1974 28 p refs
(Contract AT(45-1)-1830)
(BNWL-1845-3) Avail: NTIS HC $3.75

The separation of strontium from high-level waste, conversion to fluoride, and double encapsulation in small, high-integrity containers for subsequent long-term storage is discussed. Data necessary in the licensing of 90SrF2 as a heat source will be collected for the following: long-term SrF2 compatibility, chemical and physical properties, and capsule properties (i.e. external corrosion resistance, and crush strength). Author (NSA)

N75-24455# Interuniversitair Reactor Instituut, Delft (Netherlands).
IONIZATION IN THE TRACK OF A HIGH-ENERGY ELECTRON IN HYDROCARBON LIQUIDS. STUDY OF POSITIVE AND NEGATIVE ION SCAVENGING USING NANOSECOND PULSE RADIOLYSIS
Erika Zador, John Warman, and Andries Hummel [1974] 47 p refs
(IRI-133-74-06) Avail: NTIS HC $3.75

The lifetime distribution of the charged particles on the track of a high energy electron in cyclohexane and isooctane was considered. Results on the decay of biphenyl ions in solutions of biphenyl obtained by means of pulse radiolysis with nanosecond time resolution were compared with lifetime distributions calculated from the concentration dependence of the steady state scavenging. The discrepancy is relatively small for cyclohexane but large for isooctane. The kinetics of the reaction of the positive species in cyclohexane and isooctane with biphenyl, TMPD, and pyrene was considered. The mobile positive species in cyclohexane reacts with pyrene with a rate constant 5 x 10 to 11th Power/Ms no evidence for the existence of a mobile positive species was obtained. Author (ESRO)

N75-24456# Montpellier Univ. (France). Dept. de Physique Mathematique.
LEPTONS PRODUCTION IN HADRONIC COLLISIONS, PARTONS, VECTOR MESONS AND NEW PARTICLES
F. M. Renard Feb. 1975 31 p refs
(PM/75/3) Avail: NTIS HC $3.75

Predictions are given for the lepton pair production. Information is presented about the quark partons and the vector mesons, including constraints from deep inelastic neutrino scattering on the antiparton distribution inside the nucleons and possible existence of charmed and colored states. Heavy vector mesons and phi mesons decaying into lepton pairs are also included. Applications are presented for various hadron beams and energies in the cases where either the lepton pair or single lepton is detected. ESRO

N75-24457# Montpellier Univ. (France). Dept. de Physique Mathematique.
A MODIFIED PARTON MODEL FOR REACTIONS WITH TIME-LIKE PHOTONS
J. Layssac and F. M. Renard Feb. 1975 8 p refs
(PM/75/4) Avail: NTIS HC $3.25

A time-like photon is considered as a kind of mesonic state of a pair of valence quarks plus a sea of other pair and gluons. Consequences for positron electron annihilation and lepton pair production in hadronic collisions are examined. ESRO

N75-24458# Montpellier Univ. (France). Dept. de Physique Mathematique.
REMARKS ABOUT THE DECAYS PHI INTO PHI PLUS 2 PIONS AND PHI INTO OMEGA PLUS 2 PIONS
F. M. Renard Feb. 1975 7 p refs
(PM/75/5) Avail: NTIS HC $3.25

The decays (phi meson) into phi meson + two pions and phi meson into omega meson + two pions in connection with (rho meson) sub 1.6 into rho meson pion antipion using direct couplings and epsilon intermediate states are studied. Both mechanisms show that while the decay phi meson into omega meson + two pions is strongly suppressed, the decay (phi meson) into phi meson + two pions is probably not suppressed at all. Predictions are given for other types of this mode. ESRO

N75-24459# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
TEMPERATURE DEPENDENCE OF PARTICULATE EROSION Interim Report, 1 Jan. - 31 Jul. 1973
Bobby N. Turman Dec. 1974 24 p refs
(AF Proj. 7116)
(AD-A007841; ARL-74-0176) Avail: NTIS CSCL 18/10

Particulate erosion rate as a function of temperature has been measured over the range from 20 to 900C. Surface materials were tungsten, tungsten carbide, and copper, with zirconium carbide and tungsten carbide abrasive powders. A laser Doppler velocimeter was used to measure particle velocity, which was dependent on gas temperature. Erosion rate was normalized by dividing by the square of the particle velocity. Experimental erosion data were correlated by an empirical relationship with the material hardness of the abrasive powder and surface material. GRA

74 OPTICS

Includes light phenomena.

N75-24460 Illinois Univ., Chicago.
ON THE STATISTICAL THEORY OF THE PROPAGATION AND SCATTERING OF LIGHT IN SIMPLE FLUIDS Ph.D. Thesis
Vasundara Varatharajulu 1974 161 p
Avail: Univ. Microfilms Order No. 75-10436

The problem considered is that of a well collimated, monochromatic beam of light incident on a nonpolar fluid consisting of spherically symmetric molecules, characterized by a polarizability. Magnetic effects are neglected. The wavelength of the incident electric field is assumed to be much larger than the dimensions of the molecules and this warrants a dipole approximation for the current density. The choice for the field acting on a dipole is that of Bedeaux and Mazur, which takes into account the effect of radiation damping in a natural way. A consistent, statistical derivation of the expression for the electric field fluctuations in the medium is given in powers of the statistical density fluctuations in the fluid. Propagation between density fluctuations is described in terms of a renormalized propagator having the Clausius-Mossotti value of the refractive index. The expansion for the field fluctuations is in terms of a macroscopic Lorentz field rather than the external field. Dissert. Abstr.

N75-24461 Purdue Univ., Lafayette, Ind.
FOCUSING PROBLEMS IN WAVE PROPAGATION: A METHOD BASED ON ALMOST PLANE WAVES Ph.D. Thesis
John Ingle Bobbitt 1974 95 p
Avail: Univ. Microfilms Order No. 75-10848

A technique is discussed for determining the appropriate differential equation governing amplitudes near the focus or caustic. The technique is valid for almost plane waves; i.e., thin ray systems. The thinness technique develops an asymptotic expansion for the phase function as well as for the amplitude function. A systematic, self-consistent scheme is described which will give the correct approximations for both of these functions. In the linear optics case, higher order terms are considered to show that the method gives a consistent approximation. The technique was generalized to nonlinear systems. The nonlinear optics phenomenon that is considered is self-focusing induced by the high amplitudes of a laser. The technique was applied to equations for water waves. The nonlinear shallow water equations are considered, and result in a nonlinear Tricomi equation. The resulting system is shown to be fundamentally different from a nonlinear equation used in a problem in gas dynamics. Dissert. Abstr.

N75-24462 Brown Univ., Providence, R.I.
KAPITZA RESISTANCE AND THE REFLECTION COEFFICIENT OF HEAT PULSES Ph.D. Thesis
Chorng-Jee Guo 1974 132 p
Avail: Univ. Microfilms Order No. 75-9165

The reflection coefficient of phonons at a boundary between several dielectric crystals and liquid helium-4 was measured by the heat-pulse technique. Measurements were made for phonon pulses impinging on the crystal-helium boundary from the crystal side at nearly normal incidence. Single crystals of sapphire, silicon, sodium fluoride, lithium fluoride, and calcium fluoride were used. The ambient temperatures were between 1.5 and 3.5 K. The heater temperature of the heat pulse generators ranged from 2 K to 10 K. The reflection co-efficients were found to vary from roughly 0.6 to 0.9 for longitudinal phonons, and from 0.3 to 0.7 for transverse phonons. These results are discussed in connection with the existing theories and available data on Kapitza resistance between a solid and liquid helium, particularly at temperatures above 1K. The reflection of phonons at crystal-helium gas and crystal-solid neon boundaries was also studied. Dissert. Abstr.

N75-24463 Arizona Univ., Tucson.
THE EFFECTS OF ABBERRATIONS IN SYNTHETIC APERTURE SYSTEMS Ph.D. Thesis
Ross Brian Hooker, III 1974 180 p
Avail: Univ. Microfilms Order No. 75-11065

The effect of optical aberrations on images formed by synthetic aperture optical systems is described in terms of the pupil function, the point spread function, and the transfer function. The synthetic aperture system considered is an array of six circular pupil elements positioned at equal intervals on a circle. The ratio of the synthesized pupil diameter to the diameter of each element is four. Six aberration forms--piston error (a constant phase shift across the pupil), tilt, defocus, spherical aberration, coma, and astigmatism--were introduced independently and in combinations into one pupil element of the array. In addition, system defocus, which affects all elements of the array, was introduced. The aberrated pupil function was characterized by analytical expressions for the wavefront variance. The irradiance distribution of the point spread function, as well as the contrast and detail present in images of extended objects, was studied. The transfer function

was calculated by computer for the case of small aberrations.
Dissert. Abstr.

N75-24464 Compagnie Electro-Mecanique, Le Blanc-Mesnil (France). Lab. d'Optique Coherente.
SHAPE AND DIMENSIONAL CONTROL OF TRIDIMENTIONAL OBJECTS Final Report [CONTROLE DES DIMENSIONS ET DE LA FORME D'OBJETS TRIDIMENSIONNELS]
Ernst Mathieu and Patrice Benoit Nov. 1973 56 p refs In FRENCH
(Contract DGRST-72-7-0609)
Avail: Issuing Activity

Quality control of three dimensional objects by optical methods is discussed, and various methods for image difference are considered. Direct encoding of the object by a spatially structured illumination yields a three dimensional difference. Coherent and incoherent illuminations were used and compared. An a priori characterization of an object using Moire fringes for isolevel-curves is described along with various identification problems of the Moire fringes. A new method that permits real time visualization of the isolevel-curves was tested. ESRO

N75-24465 Nice Univ. (France).
ELECTRON PHOTON INTERACTIONS IN SEMICONDUCTORS Final Report [INTERACTION ELECTRON-PHOTON DANS LES SEMI-CONDUCTEURS]
A. Azema, J. Botineau, and A. Saissy 30 Oct. 1973 18 p refs In FRENCH
(Contract DGRST-71-7-2958)
Avail: Issuing Activity

An attempt to modulate a near infrared beam by free carriers created by photoexcitation is described. The materials studied were CdTe and CdSa. A first method whereby a He-Ne 50mW laser creates the photocarriers and perturbs another light beam for which the material is transparent gave no significant photoabsorption results as the free carrier concentration obtained was too low to enable the electron-photon interaction to occur at wavelengths below 2.5 microns. A second method using the refractive index modulation induced by the propagation of an acoustic wave in a piezoelectric material was unable to exhibit a significant direct contribution of the free electrons to the observed diffraction. The experimental setup did not allow the experiments to be performed on travelling waves. The variation of incident light intensity on the standing wave maxima is discussed. ESRO

N75-24466# Hughes Research Labs., Malibu, Calif.
LASER WINDOW SURFACE FINISHING AND COATING TECHNOLOGY Final Report, 1 May 1973 - 31 Jan. 1975
M. Braunstein, A. Braunstein, S. D. Allen, A. L. Gentile, and C. R. Giuliano Jan. 1975 103 p refs
(Contract F19628-73-C-0243; DARPA Order 2415)
(AD-A007791; AFCRL-TR-75-0041) Avail: NTIS CSCL 20/5

The program covered six areas of study: surface finishing, surface characterization, coating techniques, optical evaluation, chemical analysis, and laser window damage studies. Potassium chloride surfaces have been produced on reactive atmosphere processed (RAP) KCl using HCl etching which show an order of magnitude improvement in KCl surface damage resistance. An etch-polish procedure is reported for ZnSe which results in a significant decrease in surface absorption. An inverse dependence of 10.6 micrometers optical absorption on film deposition rate is reported for germanium films. Ultrahigh vacuum deposited Th F4 films were found to have minimum absorptions of about 10/cm. Rutherford backscattering for chemical analysis of films and window surface structure promises to be a new powerful technique. A unique modulated light ellipsometer which can operate over a broad wavelength range in the UV, visible, near IR, and 10.6 micrometers was constructed. GRA

N75-24467# Aerospace Corp., El Segundo, Calif. Science Operations.
DETERMINATION OF THE STRESS-OPTIC COEFFICIENTS OF Zn Se
Lester F. Goldstein, James S. Thompson, John B. Schroeder, and James E. Slattery 15 Sep. 1974 19 p refs
(Contract F04701-74-C-0075)
(AD-A007778; TR-0075(5539)-1; SAMSO-TR-75-10) Avail: NTIS CSCL 20/6

In high-power laser systems, windows are required in order to provide environmental isolation for the laser and tracking systems without degradation of the optical quality of the transmitted laser wavefront. Two classes of specifications must be simultaneously fulfilled by the windows: (1) Optical performance including wavefront distortion, absorption, and scatter; and (2) mechanical soundness. Mechanical forces to be considered include residual stresses within the window blank, mounting stresses, thermally induced stresses, pressure gradients, vibration, and tracking accelerations. For design verification and inspection during operation, it is desirable to have a full aperture description of the stress field and, also, to obtain such data without demounting the window. Birefringence measurements fulfill these conditions. In order to evaluate the feasibility of such a test, the authors have measured the stress optic behavior of zinc selenide (ZnSe) using He-Ne laser-illuminated interferometers. GRA

N75-24468# Raytheon Co., Waltham, Mass. Research Div.
CASTING OF HALIDE AND FLOURIDE ALLOYS FOR LASER WINDOWS Semiannual Technical Report
R. T. Newberg and J. Pappis 15 Oct. 1974 87 p refs
(Contract F19628-74-C-0148; ARPA Order 2669)
(AD-A007656; S-1764; SATR-1; AFCRL-TR-74-0518) Avail: NTIS CSCL 20/6

The problem of residual strain in castings of alkali halides (KCl and SrCl2 doped KCl) and alkaline earth fluorides (CaF2) has been overcome by the development of proper annealing and slow cooling procedures. Large castings (5-1/2 in. diameter) of CaF2 and small castings (3 in. diameter) of SrF2 have been produced with low optical absorption coefficients at 5.25 micrometers. High quality CaF2 castings have been obtained by using as starting material either high purity single crystal chips or reagent grade powder that has been subjected to reactive atmosphere processing (RAP) in Teflon vapors. GRA

N75-24469# Stanford Univ., Calif. Microwave Lab.
DEVELOPMENT OF CHALCOPYRITE CRYSTALS FOR NONLINEAR OPTICAL APPLICATIONS Final Report, 30 Jun. 1972 - 31 Oct. 1974
R. F. Begley, R. L. Byer, D. S. Chemla, M. M. Choy, and R. L. Herbst 1 Dec. 1974 144 p refs
(Contract F33615-72-C-2011)
(AD-A007838; SU-ML-2387; AFML-TR-75240) Avail: NTIS CSCL 20/5

This final report summarizes recent progress in the growth of three chalcopyrite crystals, CdGeAs2, AgGaSe2 and AgGaS2. Recent applications of these crystals to the generation of tunable infrared radiation has been more actively pursued as a result of a number of important requirements for tunable sources. The treatment includes a discussion of third and fourth harmonic generation. Recent work in AgGaSe2 for infrared generation by mixing is presented as a reprint in Appendix III. Also included in Appendix IV is a preprint of a paper describing a new model for the calculation of second order nonlinear susceptibilities. The Bond Orbital Model is a physically descriptive model which should prove useful for estimating nonlinear properties of new semiconducting crystal compounds. The accomplishments of this program have been the growth and characterization of the chalcopyrite crystals CdGeAs2, AgGaSe2 and AgGaS2 and their application to the generation of infrared radiation by second, third and fourth harmonic generation, and by mixing over the spectral range from 1 micrometer to 18 micrometers. GRA

N75-24470# Arizona Univ., Tucson. Optical Sciences Center.
DEVELOPMENT OF OPTICAL COATINGS FOR HIGH-INTENSITY LASER APPLICATIONS Final Report, Dec. 1970 - Mar. 1973
John S. Loomis Feb. 1975 70 p refs
(Contract F29601-71-C-0023; AF Proj. 3326)
(AD-A007692; AFWL-TR-74-117) Avail: NTIS CSCL 20/5

Optical coatings for high-intensity 10.6 micrometer laser applications have been developed. Three applications were examined: single-layer protective coatings for KCl and NaCl window, two-layer antireflectance coatings for KCl and NaCl windows, and multilayer high-reflectance coatings for Ge

beamsplitters. Good results were obtained for As2S3 as a protective coating on NaCl and KCl and (Ge/ZnS) as a multilayer stack n on Ge. Coating deposition techniques are described in some detail as are experimental techniques for spectrophotometric analysis of coating optical properties, calorimetric measurements of absorptance at 10.6 micrometers, and laser damage measurements using CW, 10.6 micrometers radiation. GRA

N75-24471# Naval Electronics Lab. Center, San Diego, Calif.
INTEGRATED OPTICAL CIRCUIT DEVICES Research and Development Report, 1 Apr. - 30 Sep. 1974
W. E. Martin and L. B. Stotts 1 Feb. 1975 84 p refs
(ARPA Order 2158; NELC Proj. F215)
(AD-A007512; NELC-TR-1942) Avail: NTIS CSCL 20/6

The objectives of the program described here are to advance the material and device physics of integrated optics for military applications; to establish, in concert with other Navy and DoD programs, a continuing assessment of system requirements and cost benefits for R-D investments in each application area; and to produce prototype optical elements and subsystems that are aimed at satisfying these requirements. The report includes articles on Materials and Fabrication Techniques for Integrated Optical Circuitry, Waveguide Device Properties, Pattern Fabrication Techniques, Laser Development, Fabrication and Analysis of Input/Output Waveguide Coupling, and Transients in Periodic Structures: Coupled Waves Approach. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-24472 Lehigh Univ., Bethlehem, Pa.
MEASUREMENT OF SEVERAL RATE COEFFICIENTS FOR THE He-Ne LASER PLASMA Ph.D. Thesis
Heinrich-Joachim Siebeneck 1974 139 p
Avail: Univ. Microfilms Order No. 75-10373

Select cases in which energy is transferred in a He-Ne laser plasma by atom-atom and electron-atom collisions were investigated. In particular, the de-excitation rates of the upper and lower laser level 5s'(1 1/2)2, in a laser operating in the 6328 A transition were studied. In the latter case the energy exchange occurs between two states of different azimuthal quantum numbers, and it was found that energy exchange due to electron-atom collisions occurs, but is small compared to the exchange between atoms of the same azimuthal quantum number. In some cases collisional coupling between atoms of different levels was too complicated to analyze. In those cases measurements were made for different pressures and extrapolated to zero pressures in order to obtain the pure electronic effect.
Dissert. Abstr.

N75-24473 Brown Univ., Providence, R.I.
FREQUENCY MIXING OF ELECTROMAGNETIC WAVES IN PLASMAS BY COLLISIONAL PROCESSES Ph.D. Thesis
James Raymond Clynch 1974 145 p
Avail: Univ. Microfilms Order No. 75-9137

The problem of calculating the scattered electromagnetic radiation at mixed frequencies when two or more electromagnetic waves pass through a plasma is considered. The Boltzmann equation for the spherical moments of the electron distribution function was obtained and solved in the perturbative limit. A system of diagrams was developed to enable easy identification and calculation of all terms of a given order. Nonlinear currents induced by parallel pencil beams of linearly and circularly polarized waves are calculated. The current at another frequency was calculated for the case of perpendicular propagation of the initial waves. The energy re-radiated from these currents in these cases was calculated. The re-radiation from the currents throughout the volume where the two waves are present can be made to add coherently under certain conditions forming a narrow beam.
Dissert. Abstr.

N75-24474 New York Univ., N.Y.
PLASMA EQUILIBRIA WITH CLOSED MAGNETIC FIELD LINES Ph.D. Thesis
Vincent Louis Teofilo 1974 102 p
Avail: Univ. Microfilms Order No. 75-9707

A general theory of plasma equilibria with closed magnetic field lines was developed for both the magnetohydrodynamic and guiding center models. The theory, which imposes reflection symmetry, is applicable to toroidal configurations. Under certain conditions related to the spectral structure of the equations of the model, the pressure surface topology is not simple and pressure islands develop. These are distinct from magnetic islands since the magnetic line structure remains closed. The development of these pressure islands, which occurs at a critical value of a parameter, was established in the singular, low beta shallow-well approximation of Taylor and Hastie. In this limit an explicit criterion indicating the appearance of the non simple pressure contours is derived. The toroidal perturbation and the effect of a vertical field, which in this case do not induce a simple radial shift of the equilibrium are calculated. Estimates of the pressure island thickness were obtained. Dissert. Abstr.

N75-24475 North Carolina State Univ., Raleigh.
NONLINEAR COUETTE FLOW PROBLEM IN COLLISIONAL PLASMAS Ph.D. Thesis
Surendra Kumar Bhat 1974 138 p
Avail: Univ. Microfilms Order No. 75-5344

A nonlinear Couette flow problem in collisional electrons embedded in immobile ions was studied based on a kinetic formulation. Analysis of this problem required the simultaneous solution of the Boltzmann equation for electrons and Poisson's equation for the self-consistent electric field. By expanding the distribution function in truncated half-range series and employing full-range moments method, the Boltzmann equation is transformed into a system of nonlinear ordinary differential equations. These equations coupled with the Poisson's equation describe a nonlinear two-point boundary value problem. This two-point boundary value problem was solved numerically by a perturbation technique. Discussions on the plasma-surface interaction phenomena and velocity slip phenomenon as compared to the Knudsen layer are presented. The computational strategy and difficulties involved, along with the suggestions for improving the numerical procedure, are also discussed. Dissert. Abstr.

N75-24476 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
DRIFT WAVE INSTABILITIES IN PLASMAS WITH SHEAR FLOW
Gerhard Haerendel Nov. 1974 39 p refs Submitted for publication
(MPI-PAE/Extraterr-106) Avail: Issuing Activity

The driftshear electric current resulting from the difference in average ion and electron drift in a nonuniform electric field transverse to a homogeneous magnetic field was studied. This current can act in a destabilizing manner on the equilibrium plasma distribution. Several situations were evaluated for perturbations with transverse wavelengths much larger than the average ion gyroradius but shorter than the scale of the primary nonuniformity of electric field and density. Perturbations with infinite wavelengths parallel to the magnetic field are stabilized by an inertial term due to the displacement of the ions in the direction of the zero order electric field. ESRO

N75-24477*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ABSOLUTE INTENSITY OF RADIATION EMITTED BY URANIUM PLASMAS
N. W. Jalufka, J. H. Lee (Vanderbilt Univ.), and D. R. McFarland Apr. 1975 8 p refs
(NASA-TM-X-71942) Avail: NTIS HC $3.25 CSCL 20I

The absolute intensity of radiation emitted by fissioning and nonfissioning uranium plasmas in the spectral range from 350 nm to 1000 nm was measured. The plasma was produced in a plasma-focus apparatus and the plasma properties are simular to those anticipated for plasma-core nuclear reactors. The results are expected to contribute to the establishment of design criteria for the development of plasma-core reactors. Author

N75-24478*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DETERMINATION OF ELECTRON TEMPERATURE IN A PENNING DISCHARGE BY THE HELIUM LINE RATIO METHOD

Richard W. Richardson 1975 21 p refs Presented at the 2nd Intern. Conf. on Plasma Sci., Ann Arbor, Mich., 14-16 May 1975; sponsored by IEEE

(NASA-TM-X-71677; E-8271) Avail: NTIS HC $3.25 CSCL 20I

The helium line ratio technique was used to determine electron temperatures in a toroidal steady-state Penning discharge operating in helium. Due to the low background pressure, less than .0001 torr, and the low electron density, the corona model is expected to provide a good description of the excitation processes in this discharge. In addition, by varying the Penning discharge anode voltage and background pressure, it is possible to vary the electron temperature as measured by the line ratio technique over a wide range (10 to 100+ eV). These discharge characteristics allow a detailed comparison of electron temperatures measured from different possible line ratios over a wide range of temperatures and under reproducible steady-state conditions. Good agreement is found between temperatures determined from different neutral line ratios, but use of the helium ion line results in a temperature systematically 10 eV high compared to that from the neutral lines. Author

N75-24479*# Kanner (Leo) Associates, Redwood City, Calif.

INITIAL OPERATION OF SIEMENS SUPERCONDUCTING PROTOTYPE MAGNET W VII AT THE PLASMA PHYSICS INSTITUTE

W. Amenda, D. Kullman, P. Krueger, and M. Pillsticker Washington NASA Apr. 1975 21 p ref Transl. into ENGLISH from Garching Bei Munchen (W. Germany), Report IPP 4/120, Aug. 1974 p 1-17

(NASA-TT-F-16291; IPP-4/120) Avail: NTIS HC $3.25 CSCL 20I

The first test results with a big superconductive prototype coil developed for the Garching Stellarator W VII are reported. The main dimensions of the coil are: bore = 938 mm; winding cross section = 104 x 101.5 mm; inductance = 4.44 H. Flux jumping at low currents did not start quenching. The critical current of the Nb-Ti coil reaches 91% of the short sample value. The stored energy at quenching is 1.83 MJ and the maximum magnetic field in the winding region is 61.5 kG. The mechanical stresses did not damage the windings. Degradation was not observed. A training of the coil was not necessary. Altogether the test was successful, as important technical problems were solved. Some parts of cryogenic systems should be improved in order to reduce helium losses. Author

N75-24480# California Univ., Livermore. Lawrence Livermore Lab.

GUIDING CENTER SIMULATION OF TOROIDAL PLASMAS Ph.D. Thesis

T. H. Johnson 18 Dec. 1974 291 p refs

(Contract W-7405-eng-48)

(UCRL-51725) Avail: NTIS HC $8.75

A new computer simulation method for axisymmetric toroidal plasmas is developed. The method comprises two separate physical models representing different components of an experimental plasma. The first model is an MHD fluid equilibrium representation; the technique devised for the solution of this equilibrium is several times faster than any currently in common use. The second model is a macroparticle representation which uses guiding-center formalism for the particles' velocities and positions; consequently, the timestep used by this model may be many times longer than those possible for conventional macroparticle simulations. A new computer code, GUIDON, which incorporates these models with solution for self-consistent magnetic fields, is presented. Special features of the guiding-center model are discussed in detail. Results of simulations using GUIDON are also presented. The major effort involves design simulation of the proposed Two-Component Torus (TCT) prototype reactor. Further results describing the SPIRE toroidal electron pinch accelerator, the Ware drift in Tokamaks, and a Physics International Corp. electron beam drift torus are presented. Author (NSA)

N75-24481# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.

GENERATION OF MONOCHROMATIC ELECTROSTATIC WAVES OF LARGE AMPLITUDES IN A BOUNDED BEAM-PLASMA SYSTEM

M. Bitter and P. J. Paris Dec. 1974 35 p refs

(LRP-88/74) Avail: NTIS HC $3.75

The interaction of an electron beam with a bounded argon plasma is described. Monochromatic electrostatic waves of large amplitude are excited by amplification of the beam modes in a resonance cavity. Nonlinear effects such as the generation of harmonics and sidebands are observed. ESRO

N75-24482# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.

THE BALANCE OF ROTATING PLASMA SLABS

T. Heilsten Nov. 1974 26 p refs

(TRITA-EPP-74-19) Avail: NTIS HC $3.75

Numerical solutions were obtained for the balance of single and multicomponent plasmas in long cylindrical as well as plane slab geometries. In the special case of a hydrogen-deuterium mixture, a separation degree of about 12 is obtained at a plasma flux of 6.3x10 to the 21st power ions/ms and a power input of 2.4x1 million W/m. Author (ESRO)

N75-24483# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.

THE FLUX OF PARTICLE LOSS IN A PERMEABLE PLASMA

B. Lehnert 6 Nov. 1974 15 p refs

(TRITA-EPP-74-20) Avail: NTIS HC $3.25

The steady state flux of particle loss to collectors placed at the boundary of a magnetically confined plasma being permeable to neutral gas was analyzed. This loss, as well as the particle confinement time defined from it, does not depend in a straightforward way on the plasma temperature and the particular mechanisms of plasma diffusion, but is also a function of plasma sources due to ionization and their effects on spatial plasma pressure distribution. In particular, for a class of spatially similar temperature distributions with varying maximum temperature, the neutral gas interaction can sometimes lead to Bohm-like values of particle confinement time even if the real particle losses are due to classical diffusion. Author (ESRO)

N75-24484# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.

ELECTRON PLASMA OSCILLATIONS IN A STATIC ELECTRIC FIELD

Christer Wahlberg Dec. 1974 65 p refs

(TRITA-EPP-74-21) Avail: NTIS HC $4.25

The effect of a static electric field on electron plasma oscillations in a streaming plasma is studied. The plasma is considered to be collisionless, and the time development of an initial perturbation is analyzed in a one-dimensional, linearized, Vlasov-Poisson model. Neglecting the thermal spread of the electrons, an adiabatic invariant is found involving the energy density of the fluctuating electric field and the local values of the electron streaming velocity and plasma frequency. Especially if the disturbance is due to a small localized perturbation, the total energy in the disturbance divided by the local electron plasma frequency is adiabatically conserved if the electrostatic potential has a sufficiently slow spatial variation. It is found that disturbances transported in the direction of the static electric field may gain a considerable amount of energy, whereas disturbances transported in the opposite direction are moderately damped. Futhermore, the static electric field introduces a linear phase shift in the fluctuating electric field. Author (ESRO)

N75-24485# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.

ON TORNADO TRAPS OPERATED AS ROTATING PLASMA DEVICES

B. Lehnert 6 Dec. 1974 12 p refs

(TRITA-EPP-74-22) Avail: NTIS HC $3.25

Possibility of creating and heating plasma in tornado magnetic traps is discussed, using the rotating plasma technique. Because of the field geometry of these traps, it is likely that the critical

velocity of rotating plasmas can be avoided. Compared to other types of rotating plasma devices, tornado traps would be in the situation of producing steady state, crossed field discharges at much higher rotational velocities and plasma temperatures.
Author (ESRO)

N75-24486# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
PLASMA EQUILIBRIUM IN EXTERNAL RING SYSTEMS
T. Hellsten Dec. 1974 21 p refs
(TRITA-EPP-74-23) Avail: NTIS HC $3.25

The equilibrium of a plasma situated in the space between four straight conductors was investigated by means of a numerical method. The magnetic field which confines the plasma is produced partly by parallel currents flowing in the conductors, and partly by a plasma current flowing in the opposite direction. Calculations show that there exist equilibrium states which are stable with respect to compressive and expansive perturbations. The geometrical shape of the plasma cross section depends mainly on the relative thickness of the plasma body as compared to the conductor separation distance, on the ratio between the plasma current and the conductor currents, and on the distribution of the current density in the plasma. Author (ESRO)

N75-24487# California Univ., Los Angeles. Plasma Physics Group.
LINEAR CONVERSION AND PARAMETRIC INSTABILITIES IN A NONUNIFORM PLASMA Ph.D. Thesis
Hong Chul Kim, A. Y. Wong, and R. L. Stenzel Jun. 1974 49 p refs
(Grant AF-AFOSR-2332-72; AF Proj. 9751)
(AD-A007259; PPG-177; AFOSR-75-0406TR) Avail: NTIS CSCL 20/9

A new kind of parametric instability is observed in a nonuniform plasma in which a resonant rf electric field and a density cavity grow simultaneously through mutual enhancement. The threshold is observed to be virtually zero and the growth rate is linearly dependent on pump intensity. Ponderomotive force and wave trapping are observed to be the mechanisms which drive the instability. The effects of this instability on the linear conversion and the parametric instabilities are studied.
GRA

N75-24488# Naval Research Lab., Washington, D.C.
NON-LINEAR STABILIZATION OF BEAM PLASMA INTERACTIONS BY PARAMETRIC EFFECTS Interim Report
K. Papadopoulos Mar. 1975 47 p refs
(NRL Proj. A03-16; RR0330242)
(AD-A007487; NRL-MR-3002) Avail: NTIS CSCL 20/9

The nonlinear stabilization of the kinetic stage of electron beam plasma instability by parametric effects is investigated. It is found that within a definite range of plasma parameters parametric instabilities induced by the beam generated waves can stabilize the system at a level of wave energy density substantially lower than expected by quasi-linear theory. This occurs because at a certain level of beam generated plasma waves the transfer rate of wave energy outside the spectral region in resonance with the beam induced by parametric effects exceeds the beam plasma instability growth rate. A model of a quasi-steady state for the case of continuous beam injection is proposed. The possibility of using ultra-relativistic electron beams for achieving ignition temperatures in a Tokamak is discussed.
GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N75-24489 Pennsylvania State Univ., University Park.
THE EFFECT OF ANISOTROPY ON THE PIEZOELECTRIC POLARON Ph.D. Thesis
James Joseph Licari 1974 155 p
Avail: Univ. Microfilms Order No. 75-9802

A continuum theory was used to derive an anisotropic piezoelectric polaron Hamiltonian. The intermediate coupling theory was applied to this Hamiltonian, and it is shown that the polaron velocity stays below the velocity of the phonons moving in the same direction as the polaron. The angular dependence of the electron-acoustic phonon coupling constant is derived from the anisotropic Hamiltonian and average values for the quasi-longitudinal and quasi-transverse branches were obtained. The increase in effective mass due to the polaron effect was also calculated for slow polarons. All numerical results refer to CdS. The effect is considered of both the optical and acoustic phonons on the donor binding energy in CdS, and the acoustic phonons are considered in the framework of the anisotropic Hamiltonian. Dissert. Abstr.

N75-24490 Clemson Univ., S.C.
ELECTRON TUNNELING IN SEMIMETALLIC FILMS Ph.D. Thesis
Dattatraya Gopal Bhave 1974 59 p
Avail: Univ. Microfilms Order No. 75-11512

Some Al-Al2O3-Bi and Al-Al2O3-Sb tunnel junctions were studied in an effort to look for the evidence of quantum size effect. In bismuth the wavelength of the electrons at the Fermi surface is about 10 to the -7th power m. It is easy to make bismuth films of this thickness. Tunnel junctions with bismuth films varying in thickness d from 30 nm to 200 nm were studied. The junctions were studied for their current-voltage characteristics at 295 K, 77 K, 4.2 K and below 2 K where the aluminum films were superconducting. The characteristics were nonlinear and showed a visible gross structure. To look at the structure in greater detail, the dynamic resistance dV/dI versus the voltage bias was plotted experimentally at 77 K, 4.2 K, and below 2 K. These characteristics show the changes in the slope of the current-voltage characteristics in much greater detail. However, no evidence of quantum size effect was observed.
Dissert. Abstr.

N75-24491 Michigan Univ., Ann Arbor.
PROPERTIES AND POTENTIAL OF BARITT DEVICES Ph.D. Thesis
Siang-Ping Kwok 1974 240 p
Avail: Univ. Microfilms Order No. 75-10209

The basic device mechanism and the dc and microwave properties of BARITT (barrier injection transit time) devices were studied in order to determine their potential power capability and efficiency. The I-V characteristic of the punch-through structure with a general doping profile was derived and experimentally verified. The limitation of the present thermionic emission theory was investigated experimentally. A complete set of numerical algorithms for solving dc, small-signal and large-signal problems of BARITT devices based on a single-carrier model was developed. By comparing the numerical results with those of a Read-type large-signal theory developed, it was found that the limited value of optimum dc current density, the carrier diffusion, and the depression of electric field under large-signal modulation severely limit the power and efficiency of BARITT devices. Dissert. Abstr.

N75-24492 New Orleans Univ., La.
LOW TEMPERATURE CALORIMETRY OF TRANSITION METAL ALLOYS Ph.D. Thesis
Kanhaiya Lal Agarwal 1974 100 p
Avail: Univ. Microfilms Order No. 75-10815

Previously reported anomalous superconducting behavior of dilute hexagonally-close-packed alloys of 3d-ferromagnetic metals (Cr, Mn, Fe, Co and Ni) with titanium was investigated. The alloys were prepared from high purity titanium and the solutes, and were properly heat-treated. A low temperature calorimeter was specially constructed to carry out this work. The elements Sc and V were included to make this a complete systematic calorimetric study of dilute hcp 3d-metal alloys with titanium. Systematic trends in hardness, residual resistivity, and electronic coefficient of specific heat of these alloys were observed. The alloys were also examined for superconductivity by electrical resistivity measurements. New results were obtained for Ti-Cr alloys and are discussed along with the calorimetric measurements of Ti-Hf alloys and of high purity calcium. New values for the Debye temperature and the coefficient of electronic specific heat for calcium were obtained. Dissert. Abstr.

N75-24493 Duke Univ., Durham, N.C.
A STUDY OF THE PHYSICAL PROPERTIES AND BISTABLE CONDUCTION CHARACTERISTICS OF AMORPHOUS BISMUTH THIOXIDE THIN FILMS Ph.D. Thesis
Jake Hallie Halford 1974 182 p
Avail: Univ. Microfilms Order No. 75-10704

Bistable switching characteristics were observed in Au-Bi2O3-Au thin-film devices. The 5000-A Bi2O3 films were deposited in the amorphous phase (alpha-Bi2O3). Film density was found to increase with deposition time and resulted in the modification of the oscillating quartz crystal film-thickness control method. Partial pressure measurements showed Bi2O3 melt decomposition. Stoichiometric analysis of the Bi2O3 melt and deposited films showed Bi contents increasing as deposition time increased. Dielectric and optical properties were studied as a function of deposition time and the optical band gap determined. Annealing of alpha-Bi2O3 films resulted in an alpha-Bi2O3 yields beta-Bi2O3 phase transition. Conductivity measurements of the alpha-Bi2O3 and beta-Bi2O3 phases showed the beta-Bi2O3 phase to have a much higher conductivity. Dissert. Abstr.

N75-24494 California Univ., Irvine.
EFFECT OF THE QUASIPARTICLE-PAIR INTERFERENCE CURRENT ON THERMAL FLUCTUATIONS IN WEAKLY COUPLED SUPERCONDUCTORS AND ON THE OPERATION OF RF-BIASED SQUIDS Ph.D. Thesis
Charles Maurice Falco 1974 203 p
Avail: Univ. Microfilms Order No. 75-11027

Careful studies of the effect of thermal fluctuations on the I-V characteristics of two different types of weakly coupled superconductors have been made. Measurement on externally shunted, oxide-barrier tunnel junctions were found to be in complete quantitative agreement with a theory due to Ambegaokar and Halperin. Similar measurements were found to be in qualitative agreement with a theory due to Kurkijarvi and Ambegaokar. A study of the operating characteristics of rf-biased thin-film superconducting quantum interference devices (SQUIDs) was made and a set of performance parameters developed to optimize the behavior of these devices. The behavior of these SQUIDs was compared with a theory due to Hansma in order to look for the effect of the phase-dependent quasiparticle-pair interference current. The measurements were found to be qualitatively different than predicted by Hansma's theory. Dissert. Abstr.

N75-24495 Yale Univ., New Haven, Conn.
THE EFFECTS OF TOPOLOGY ON THE PROPERTIES OF RANDOM NETWORK MODELS FOR AMORPHOUS GROUP 4 SEMICONDUCTORS Ph.D. Thesis
Selma Goldstein 1974 165 p
Avail: Univ. Microfilms Order No. 75-11268

The electronic energy band structures were calculated for Si III and Ge III using the tight-binding Hamiltonian developed by Weaire which generates a two-band density of states. An analytic transformation between the states of this Hamiltonian and those of a related one having a one-band density of states were used for calculational ease. The results demonstrate that in Ge III the size of the band gap is increased over its value in Si III, due to a retreat of the conduction band edge in the presence of odd-fold rings of bonds. If a model similar to Ge III were used to represent an amorphous phase of tin, this structure would be a semiconductor as opposed to a semimetal as is diamond cubic tin. Since random network models have fewer fivefold rings than does Ge III, alloys of germanium and tin were examined to determine the behavior of the band gap for differing structures. Dissert. Abstr.

N75-24496 Purdue Univ., Lafayette, Ind.
ELECTRICAL TRANSPORT PROPERTIES IN n GaSb UNDER HYDROSTATIC PRESSURE Ph.D. Thesis
Ru-Yih Sun 1974 114 p
Avail: Univ. Microfilms Order No. 75-10969

Electrical transport measurements have been made on n-type GaSb in the temperature range between 1.4 K and 300 K and at hydrostatic pressures up to approximately 13 kbar. The pressures were achieved by using a clamp technique with a kerosene-mineral oil mixture as the pressure transmitting medium. Thirteen tellurium-doped samples and one selenium-doped sample were investigated. A high pressure measurement on a single Se-doped n-GaSb sample shows both impurity conduction at low temperatures and deionization effects at elevated temperatures. The observed activation energy is 0.074 eV, and is ascribed to thermal excitation from a Se impurity level associated with the L sub 1-minima, into the L sub 1-conduction band. The result is in good agreement with previous determinations of this parameter by Kosicki and Paul. Dissert. Abstr.

N75-24497 Ohio State Univ., Columbus.
MINORITY CARRIER KINETICS IN DEFECT TRAP DISTRIBUTIONS IN SEMICONDUCTORS: APPLICATION TO TRIGONAL SELENIUM SINGLE CRYSTALS Ph.D. Thesis
Philip Ross Swinehart 1974 137 p
Avail: Univ. Microfilms Order No. 75-11434

The decay of photocurrent in a semiconductor with an exponential distribution of deep-minority carrier traps is described in terms of well-known functions. A recombination lifetime short compared to the trapping time, slow retrapping, and carrier mobilities unaffected by incident radiation are assumed. The majority carrier concentration is controlled by the release of minority carriers. The decay scales, the energy limits, and capture cross section can be determined independently. Retrapping at long times causes a second logarithmic decay from which the total density of traps can be determined. It is shown that continuous excitation with highly absorbed light fixes the charge state of the surface and greatly reduces the influence of surface processes. Dissert. Abstr.

N75-24498 Duke Univ., Durham, N.C.
NUCLEAR MAGNETIC RESONANCE STUDIES OF SOLID HYDROGEN UNDER HIGH PRESSURE Ph.D. Thesis
Paul Lester Pedroni 1974 221 p
Avail: Univ. Microfilms Order No. 75-10718

A ram-piston technique was used to obtain pressures up to 6000 kg/sq cm, corresponding to maximum density of rho = 1.7 rho sub 0, where rho sub 0 is the density of solid hydrogen at zero pressure. The temperature range covered was 1.2 k less than or equal to T less than or equal to 4.2K. Properties of solid hydrogen measured are given. The measurements were to discover if theories which agree well with measurements taken at zero pressure are also adequate to describe measurements taken at high pressures. Dissert. Abstr.

N75-24499 Lignes Telegraphiques et Telephoniques, Conflans-Sainte-Honorine (France). Lab. d'Etudes Microelectroniques.
POSSIBLE IMPROVEMENTS TO HF DEVICES DERIVED FROM IRRADIATIVE CONTROL OF THE DIFFUSION PROCESSES Final Report [ETUDE DES POSSIBILITES D'AMELIORATION APPORTEES PAR LA DIFFUSION CONTROLEE PAR IRRADIATION AUX DISPOSITIFS HYPERFREQUENCE]
J. M. Laforsse, J. L. Assemat, and A. Brelot Jan. 1974 42 p refs In FRENCH
(Contract DGRST-72-7-0538)
(DTCE/3096) Avail: Issuing Activity

The influence of crystal defects on diffusion processes is discussed with regard to irradiative control of the diffusion profiles and their improvement. Electron irradiation and ion and proton implantation are considered. It was shown that the diffusion of P requires a lacunar mechanism, that Av, Zn, Cu diffuse by interstitial mechanism while B diffuses by both mechanisms. The influence of defects on redistribution of implanted atoms was considered as a function of temperature showing the existence of a second diffusion tail electrically neutral above 850 C. Controlled diffusion above 800 C was used successfully to steepen the slope of the epitaxy-substrate interface. Low atomic displacements and high concentration impurity evolution were studied by infrared interferometry. Schottky diodes at 30 GHz nomial frequency with cutoff around 300 GHz were produced.
ESRO

N75-24500 Laboratoires d'Electronique et de Physique Appliquee, Paris Limeil-Brevannes (France).
PERFORMANCE IMPROVEMENT OF A FIELD EFFECT TRANSISTOR WITH SCHOTTKY BARRIER ON GaAs Final Report [AMELIORATION DES PERFORMANCES DU TRANSISTOR A EFFET DE CHAMP A BARRIERE DE SCHOTTKY SURGaAs]

Veilex, P. Baudet, M. Binet, D. Boccon-Gibod, and J. P. Chane Nov. 1973 36 p ref In FRENCH
(Contract DGRST-72-7-0536)
(MB/DL-CRL-32/43) Avail: Issuing Activity

A set of improvements of the FET with Schottky barrier on GaAs are reported. The epitaxial growth optimal conditions are discussed with regard to influence of oxygen and Cu, the buffer zone, and delayed growth technology optimization was performed by studying the isolation by ionic cleaning, oxygen implantation and chemical cleaning, photoengraving and contact techniques, localized N plus epitaxies, and study of the various geometries. The doping of the epitaxial zones was multiplied by two with corresponding thickness decrease while increasing the mobility. A characterization method both in concentration and thickness was found. As a result the cutoff frequency increased from 8 to 30 GHz while the noise factor at 6GHz decreased from 9 to 3.8dB. A computerized simulation of the transistor equivalent circuit was refined to the point that X-band performance may be forecast with cutoff at 37 GHz and 4 db noise factor. ESRO

N75-24501 Paris Univ. (France). Lab. de Physique des Solides.
SbSI PHYSICAL PROPERTIES NEAR THE FERROELECTRIC PHASE CHANGE POINT Final Report [ETUDE DES PROPRIETES PHYSIQUES DE SbSI AU VOISINAGE DU POINT DE CHANGEMENT DE PHASE FERROELECTRIQUE]
M. Balkanski May 1974 11 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2861)
Avail: Issuing Activity

The soft mode behavior of a SbSi crystal is studied in the vicinity of the ferro-paraelectric phase transition. Two mode-couplings between optical phonons are evidenced by the use of hydrostatic pressure technique and controlled by the existence of transfer of Raman intensity toward the energy crossing points. Raman resonance effect is also studied and interpreted on the basic of Loudón's model. Furthermore, the electronic bands structure is calculated and compared with absorption edge's measurements. Experimental results are also obtained for the dichroism, the photoconductivity, the dielectric constant and the Franz Keldysh effect. Author (ESRO)

N75-24502*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MAGNETIC TORQUE ON A ROTATING SUPERCONDUCTING SPHERE
Louis B. Holdeman Washington May 1975 52 p refs
(NASA-TR-R-443; M138) Avail: NTIS HC $4.25 CSCL 20C

The London theory of superconductivity is used to calculate the torque on a superconducting sphere rotating in a uniform applied magnetic field. The London theory is combined with classical electrodynamics for a calculation of the direct effect of excess charge on a rotating superconducting sphere. Classical electrodynamics, with the assumption of a perfect Meissner effect, is used to calculate the torque on a superconducting sphere rotating in an arbitrary magnetic induction; this macroscopic approach yields results which are correct to first order. Using the same approach, the torque due to a current loop encircling the rotating sphere is calculated. Author

N75-24503*# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
FOUR PARTICLE EXCHANGE IN SOLID He-3
A. K. McMahan [1975] 10 p refs
(Grants NGR-33-010-188; DMR74-23494)
(NASA-CR-142801; Index-67.80-Jd) Avail: NTIS HC $3.25 CSCL 20L

Calculations which demonstrate a physically important four-atom exchange process in bodycentered cubic He crystal and thus an important four-spin term in the exchange Hamiltonian are discussed. A simple, mean-field analysis of this Hamiltonian appears to account for a number of the perplexing properties of bodycentered cubic He crystal. It is suggested that an understanding of other properties may require treatment of the exact four-spin term. Author

N75-24504*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESEARCH FOR PREPARATION OF CATION-CONDUCTING SOLIDS BY HIGH-PRESSURE SYNTHESIS AND OTHER METHODS Final Report, 1 Aug. 1973 - 28 Feb. 1975
J. B. Goodenough, H. Y.-P. Hong, J. A. Kafalas, and K. Dwight, Jr. 31 Mar. 1975 30 p refs
(NASA Order C-43205-C)
(NASA-CR-134836; 43205-C/FR/75) Avail: NTIS HC $3.75 CSCL 20L

It was shown that two body-centered-cubic skeleton structures, the Im3 KSbO3 phase and the defect-pyrochlore phase A(+)B2X6, do exhibit fast Na(+)-ion transport. The placement of anions at the tunnel intersection sites does not impede Na(+)-ion transport in (NaSb)3)(1/6 NaF), and may not in (Na(1+2x)Ta2 5F)(Ox). The activation energies are higher than those found in beta-alumina. There are two possible explanations for the higher activation energy: breathing of the bottleneck (site face or edge) through which the A(+) ions must pass on jumping from one site to another may be easier in a layer structure and/or A(+)-O bonding may be stronger in the cubic structures because the O(2-) ion bonds with two (instead of three) cations of the skeleton. If the former explanation is dominant, a lower activation energy may be achieved by optimizing the lattice parameter. If the latter is dominant, a new structural principle may have to be explored. Author

N75-24505*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF THE MOS-C-V TECHNIQUE TO DETERMINE IMPURITY CONCENTRATIONS AND SURFACE PARAMETERS ON THE DIFFUSED FACE OF SILICON SOLAR CELLS
I. Weinberg 1975 8 p refs Presented at the 11th Photovoltaic Specialists Conf., Phoenix, Ariz., 6-8 May 1975; sponsored by IEEE
(NASA-TM-X-71721; E-8307) Avail: NTIS HC $3.25 CSCL 20L

The feasibility of using the MOS C-V technique to obtain information regarding impurity and surface state concentrations on the diffused face of silicon solar cells with Ta2O5 coatings is studied. Results indicate that the MOS C-V technique yields useful information concerning surface parameters which contribute to the high, efficiency limiting, surface recombination velocities on the n+ surface of silicon solar cells. Author

N75-24506*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF NEW DIELECTRICS FOR MINIATURIZED HIGH-PERFORMANCE CAPACITORS
M. Perigord Washington NASA Jun. 1975 19 p refs Transl. into ENGLISH from Radiotechnique-Compelec (Paris), Dec. 1973 12 p Prepared in cooperation with Bordeaux Univ., (France)
(Contract NASw-2481)
(NASA-TT-F-16383) Avail: NTIS HC $3.25 CSCL 20L

Dielectric characteristics of fluorides and oxyfluorides of several metals were studied in pellet and in thin-film form. These films were obtained by thermal and flash evaporation, and by radio frequency cathode pulverization. Among the oxyfluorides with high permittivity two demonstrate ceramic like properties and also can be made into thin films suitable for use in microminiaturized capacitors. Author

N75-24507*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MORPHOLOGICAL GROWTH OF SPUTTERED MoS2 FILMS
Talivaldis Spalvins 1975 19 p refs Proposed for presentation at Lubrication Conf., Miami Beach, Fla.; sponsored by Am. Soc. of Lubrication Engr. and ASME
(NASA-TM-X-71742) Avail: NTIS HC $3.25 CSCL 20B

Sputtered MoS2 films from 300 A to 20,000 A thick were deposited on metal and glass surfaces. The substrate effects such as surface temperature, finish, pretreatment and chemistry as they affect the film formation characteristics were investigated by optical, electron transmission, electron diffraction, and scanning electron microscopy. Substrate temperature and surface chemistry were found to be the prime variables as to the formation of a crystalline or amorphous film. The friction characteristics are strictly

influenced by the type of film formed. Surface chemistry and surface pretreatment account for compound formation and corresponding grain growth, which directly affect the adhesion characteristics, resulting in poor adherence. The type of surface finish (topography) as related to scratches, impurities, inhomogeneities, etc., are favorable nucleation sites for the growth of isolated and complex nodules within the film, and various complex surface overgrowths on the film. These nodular growth features have progressively more undesirable effects on the film behavior as the film thickness increases. Author

N75-24508# Lockheed Missiles and Space Co., Palo Alto, Calif.
THERMAL MECHANISM OF THE SWITCHING EFFECT IN OXIDIZED VANADIUM
B. A. Tallerchik, E. I. Terukov, and F. A. Chudnovskii [1974] 6 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (USSR), v. 26, no. 2, 1975 p 257-262
Avail: NTIS HC $3.25, National Translations Center, John Crerar Library, Chicago, Illinois 60616

Experimental data characterizing the switching phenomenon in oxidized vanadium were obtained. To explain the switching phenomenon, thermal models of the critical temperature and thermistor temperature were used. Author

N75-24509# Argonne National Lab., Ill.
CRITICAL CURRENT DENSITY IN SUPERCONDUCTING NIOBIUM FILMS
R. P. Huebener, R. T. Kampwirth, R. L. Martin, T. W. Barbee, Jr., and Zubeck, R.B. 1974 4 p refs Presented at Applied Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974
(Contract W-31-109-eng-38)
(Conf-740957-21) Avail: NTIS HC $3.25

The critical current at 4.2 K was measured in Nb-strips of 1 micron thickness and different width, w, prepared by electron-beam vacuum-deposition. The substrate temperature during the deposition was varied between room temperature and 800 C. The width of the Nb strips ranged between 20 and 300 microns. Whereas up to 600 C the different substrate temperatures yielded about the same average critical current density, (critical current divided by sample cross section) the specimens prepared with 800 C substrate temperature showed a reduction of critical current density by a factor of 4 to 8. In zero applied magnetic field, the samples prepared with 400 C substrate temperature or lower showed a decrease of critical current density. Critical current data obtained in an applied perpendicular field, for the high-field regime, were compared with Kramer's theory of flux pinning which assumes plastic shearing of the flux-line lattice around individual pinning sites during flux flow. Author (NSA)

N75-24510# Argonne National Lab., Ill.
HIGH FIELD SUSCEPTIBILITY IN FERROMAGNETIC NpOs2
B. D. Dunlap, A. T. Aldred, D. J. Lam, and G. R. Davidson 1974 7 p refs Presented at Intern. Symp. on the Electronic Structure of the Actinides, Argonne, Ill., 9 Oct. 1974
(Contract W-31-109-eng-38)
(Conf-741057-3) Avail: NTIS HC $3.25

NpOs2 is known to be a ferromagnet with a Curie temperature of 7.5 K. Results of bulk magnetization measurements indicated a field induced magnetization even well below the transition temperature. This was extended by a measurement of the local high-field susceptibility, using the Mossbauer effect. A large susceptibility is best understood by a model of itinerant magnetism, although other properties of the material indicate localized behavior. Author (NSA)

N75-24511# Brookhaven National Lab., Upton, N.Y.
EFFECT OF METALLURGICAL HISTORY ON Jc(5T) IN SURFACE DIFFUSED MULTIFILAMENTARY Nb3Sn
A. D. McInturff and D. C. Larbalestier 30 Sep. 1974 12 p refs Presented at Appl. Superconductivity Conf., Oakbrook, Ill., 30 Sep. - 2 Oct. 1974 Sponsored in cooperation with ERDA and Sci. Res. Council, Chilton, Engl.
(BNL-19271; Conf-740957-23) Avail: NTIS HC $3.25

Data are presented of critical current density J sub c (5T) at a 5 T perpendicular magnetic field (10 T for selected samples) for multifilamentary Nb3Sn formed by Sn diffusion from a Cu-Nb composite's outer surface. The parameters varied are: composite diameter and ratio; Sn percentage; filament diameter; reaction temperature and time; and different combinations of the above sequences. The composite diameter varied from 0.254 to 0.08 mm; Cu/Nb volume ratio from 1.7 to 3; Sn volume from 2 to 13.8% of the total volume; average filament diameter from 2 to 7 microns. The reaction temperature was between 550 to 795 C for varying lengths of time, one to several thousand hours. A three-stage heat treatment was selected to formulate the basis for the reaction heat treatment map. The optimum performances were 38.8 A in 0.127 mm dia 1.9 Cu/1 Nb (Nb3Sn) composite at 5 T and 78 A in a 0.18 mm dia 3/1 Cu/Nb (Nb3Sn) at 5 T. Author (NSA)

N75-24512# Brookhaven National Lab., Upton, N.Y.
EFFECT OF SURFACE METALLURGY ON THE PENETRATION DEPTH AND RF BREAKDOWN FIELD OF SUPERCONDUCTING NIOBIUM
C. Varmazis, T. S. Luhman, A. Joshi, O. F. Kammerer, S. Giordano, and M. Strongin 1974 4 p refs Presented at Applied Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974 Sponsored by ERDA
(BNL-19276; Conf-740957-22) Avail: NTIS HC $3.25

The surface metallurgy of niobium is discussed including factors such as impurity distributions at the surface and surface topography. Measurements of the penetration depth are presented both in the clean limit, where there is about a 20A region of oxygen at the surface, after high temperature heat treatment, which affects the boundary condition on the GL order parameter; and in the dirty limit where heating in an oxygen atmosphere near 10 to the -6th power torr can greatly affect the surface roughness. Auger measurements of the surface conditions in a 1% Zr in Nb alloy are also presented. A discussion is given of preliminary results in a special apparatus where RF breakdown experiments can be performed on small samples and correlated with the metallurgical factors mentioned.
Author (NSA)

N75-24513# California Univ., Livermore. Lawrence Livermore Lab.
SHOCK WAVES IN HYDROGEN ISOTOPES AND THEIR HIGH PRESSURE EQUATION OF STATE
M. VanThiel, B. L. Hord, and K. Boutwell (Gen. Motors Corp., Goleta, Calif.) 23 Oct. 1974 7 p refs Presented at 4th Intern. Conf. on High Pressure, Kyoto, 25-29 Nov. 1974 Sponsored by ERDA
(UCRL-75727; Conf-741116-2) Avail: NTIS HC $3.25

Shock wave methods for compressing liquid deuterium and hydrogen samples from 21 K and 0.15 MPa to high pressures with strong shocks are described. Both explosives and a two-stage-light gas gun were used. Although the temperatures range from 1100 to 7000 K, the data are reasonably well represented by a simple solid-state model. The small value of delta P/delta E required to fit the high pressure data, however, suggests that the fluid is not simply diatomic under these extreme conditions. Author (NSA)

N75-24514*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ION IMPLANTATION OF DIATOMIC SULFUR INTO GaAs M.S. Thesis
Robert P. Lyons Sep. 1974 105 p refs
(AD-A006801; GE/EE/74-54) Avail: NTIS CSCL 20/12

Reproducibility of S implantation in GaAs has been a controversial subject for some time. In this project S(2+) was obtained from elemental sulfur ionized by both Ar and CO2 plasmas. The Ar carrier produced an unstable 2.8 microamp beam of 90 keV S(2+) ions, whereas the CO2 carrier produced a very stable 6 - 8 microamp beam of 90 and 141 keV S(2+). That both sources produced S(2+) with no oxygen content, was proven by differential Auger analysis of the GaAs targets. The high conductivity (12.74 ohm-cm) of the as-implanted samples changed to that of the substrate (10 to the 10th power ohm-cm) after the anneal. Temperature dependence of resistivity of the as-implanted samples was determined and two activation energies were calculated from these data. The necessary modifications of the available equipment and the design of new subsystems was accomplished in this project, including the substrate heater controller and pyrolytic reactor. GRA

N75-24515# Massachusetts Inst. of Tech., Cambridge.
ELECTRONIC TUNNELING AND STRUCTURE OF SUPERCONDUCTING NIOBIUM SINGLE CRYSTALS Final Report, 1 Feb. 1970 - 31 Dec. 1974
24 Feb. 1975 9 p refs
(Contract N00014-67-A-0204-0041; NR Proj. 039-087)
(AD-A007580) Avail: NTIS CSCL 20/12

Attempts were made to explore, by tunneling into single crystals, the superconducting properties of the transition metals, particularly niobium. Rhenium, amorphous carbon fiber barriers, and multiband, multigap superconductivity were covered. Data from the analysis of phonon spectra and strong coupling parameters are included. Author

N75-24516# Illinois Univ., Urbana. Coordinated Science Lab.
ION IMPLANTATION SOURCES AND SOURCE MATERIALS
Steven Everett Maulding Jan. 1975 95 p refs
(DAAB07-72-C-0259)
(AD-A007431; R-671; UILU-ENG-75-2204) Avail: NTIS CSCL 20/12

The method of doping semiconductors through the use of ion implantation has become of great industrial interest. The ability to measure accurately the quantity of ions being implanted in the sample allows better control of concentration than is possible with diffusion. This close control is particularly important in MOS threshold voltage adjustment. The ability to create pure, high current, stable beams of various dopant materials is the primary concern of this work. First, the basic elements of an implanter and ion sources are reviewed, with an emphasis on the mechanisms of beam creation. Then, the mass spectra (beam analysis) obtained from three sources on an Accelerators Inc. 300-MP ion implanter are given for a variety of source materials. Finally, for each source material, recommendations are made as to which source produces the desired beam characteristics. GRA

N75-24517# Army Foreign Science and Technology Center, Charlottesville, Va.
SOME ELECTRICAL AND PHOTOELECTRICAL PROPERTIES OF CdSnP2 SINGLE CRYSTALS
I. A. Karpovich, V. V. Podolskii, E. I. Leonov, and V. M. Orlov 27 Sep. 1974 7 p refs Transl. into ENGLISH from the book "Troinye poluprovodniki All Bivcv2 i aii B2iii cvi4 (Kishinev), 1972 p 122-124
(AD-A007863; FSTC-HT-23-949-74) Avail: NTIS CSCL 20/12

Results of investigations of several electrical and photoelectrical properties of single crystals of CdSnP2 are presented. These include the temperature-dependence of Hall mobility, the electroconductivity, and the thermal stimulated conductivity. Also included are the temperature variations of the dark conductivity, light conductivity and photoconductivity relaxation time for crystals alloyed with copper. GRA

N75-24518# Radio Corp. of America, Princeton, N.J.
PIEZOELECTRIC ALUMINUM NITRIDE FILMS Final Report, 12 Oct. 1972 - 30 Sep. 1974
Michael T. Duffy and Chih C. Wang Oct. 1975 139 p refs
(Contract F19628-73-C-0023; AF Proj. 5635)
(AD-A007657; PRRL-74-CR-65; AFCRL-TR-74-0559) Avail: NTIS CSCL 09/1

Piezoelectric films of AlN and GaN were grown on sapphire substrates for use in the generation, propagation, and processing of surface acoustic waves. The films were grown by CVD heteroepitaxy using the metal-organic reactants trimethyl aluminum or trimethyl gallium. Greatest emphasis was placed on optimization of the aluminum nitride-sapphire system as determined by the (1,1,-2,0)AlN/(1,-1,0,2)Al2O3 epitaxial relationship. The films were examined with respect to crystallography, surface topography, optical properties, uniformity, and ease of polishing. A wide range of epitaxial growth temperatures was covered in order to establish optimum conditions for the growth of relatively thick films with minimum surface structure and residual composite strain. The possibility of growing silicon on the same substrate with AlN in a side-by-side configuration was examined and shown to be feasible. Aluminum transducer patterns were fabricated on some samples to form delay lines. GRA

N75-24519# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMOELECTRIC PROPERTIES OF CERAMIC REFRACTORY SEMICONDUCTORS
Yu. M. Goryachev and T. M. Yarmola 10 Nov. 1974 17 p refs Transl. into ENGLISH from the 4th Conf. on Ceramics for Electron., Spindleruv mlyn, USSR, 12-14 May 1971 p 1-12
(AD-A007862; FSTC-HT-23-0005-75) Avail: NTIS CSCL 20/12

The effect of thermal variation on the electrical properties of heat-resistant semiconductors is discussed. The relations of the properties and electron structure of heat-resistant semiconductors are studied. The whole is illustrated by tables and figures. GRA

N75-24520# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
MAGNETIC PROPERTIES OF NEODYMIUM-SAMARIUM-COBALT ALLOYS
William G. D. Frederick, Harold J. Garrett, and Michael Hoch Feb. 1975 127 p refs
(AF Proj. 7371)
(AD-A007848; AFML-TR-73-318) Avail: NTIS CSCL 20/12

The purpose of this investigation is to determine the magnetic properties of the pseudo-binary alloy system Nd(1-x)Sm(x)Co5, in particular the variation of the magnetization and magnetocrystalline anisotropy with temperature and composition. The special interest in these variables stems from their quantitative relationships to magnetic domain wall characteristics and the relationship of domain walls to RCo5 coercivity, the key parameter in the development of permanent magnets. The experimental method used is based on the measurement of the magnetization parallel and perpendicular to the c-axis of single crystals of the alloy system with a vibrating sample magnetometer. Analysis of the data is made on the basis of the single-ion model of magnetic anisotropy. GRA

N75-23805 Institut Franco-Allemand de Recherches, St. Louis (France).
NONLINEAR CONVERSION OF FERROELECTRIC ENERGY AND ENERGY CONVERSION BY FORCED TRANSITION WITH Pb(Zr SUB (1-x)Ti SUB x)O3 CERAMICS [NICHTLINEARE UMWANDLUNG FERROELEKTRISCHER ENERGIE UND ENERGIE-UMWANDLUNG DURCH ERZWUNGENEN UEBERGANG MIT Pb(ZrSUB1-xTiSUBx)O3-KERAMIKEN]
Francois Bauer *In its* Selected Contrib. to High-Speed Phys. 1974 p 3-21 refs In GERMAN; ENGLISH summary (For availability see N75-23804 15-31)

N75-24658 Joint Publications Research Service, Arlington, Va.
ACHIEVEMENTS AND TASKS OF SOLID-STATE RESEARCH IN HUNGARY
Gyorgy Pataki *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 9-15 Transl. into ENGLISH from Magyar Tudomany (Budapest), no. 2, Feb. 1975 p 108-111 (For availability see N75-24655 15-99)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-24521# Technische Universitaet, Munich (West Germany).
THE PROBLEM OF INTEGRATION IN THE CYBERNETIC SYSTEM THEORY OF KARL DEUTSCH Ph.D. Thesis [DAS PROBLEM DER INTEGRATION IN DER KYBERNETISCHEN SYSTEMTHEORIE VON KARL DEUTSCH]
Christine Kirschstein 1974 206 p refs In GERMAN
Avail: NTIS HC $7.25

An introduction to the cybernetic concept is followed by a functional analysis of the effects of a cybernetic integration model on political communication and control systems. Emphasis is placed on the specific properties of various social systems and their inherent restrictions on control manipulations.

Transl. by G.G.

N75-24522*# Texas Univ. Health Science Center, Houston.
URBAN ENVIRONMENTAL HEALTH APPLICATIONS OF REMOTE SENSING
Marjorie Rush, Janice Goldstein, Bartholomew P. Hsi, and Calvin B. Olsen Nov. 1974 245 p refs
(Contract NAS9-12823)
(NASA-CR-141796) Avail: NTIS HC $7.50 CSCL 06F

An urban area was studied through the use of the inventory-by-surrogate method rather than by direct interpretation of photographic imagery. Prior uses of remote sensing in urban and public research are examined. The effects of crowding, poor housing conditions, air pollution, and street conditions on public health are considered. Color infrared photography was used to categorize land use features and the grid method was used in photo interpretation analysis. The incidence of shigella and salmonella, hepatitis, meningitis, tuberculosis, myocardial infarction and veneral disease were studied, together with mortality and morbidity rates. Sample census data were randomly collected and validated. The hypothesis that land use and residential quality are associated with and act as an influence upon health and physical well-being was studied and confirmed. L.B.

N75-24523# National Science Foundation, Washington, D.C.
ABSTRACT REPORTS: PRESENTED AT THE MEETINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
Berton F. Hill Dec. 1971 346 p refs Meeting held at Philadelphia, 28-29 Dec. 1971
(PB-239273/6; NSF-72-22) Avail: NTIS HC $9.50 CSCL 05B

Abstracts of research projects conducted in 1971 are presented. Each project has dealt with the scientific or technological aspects of a socially relevant problem. The abstracts are intended to assist users in identifying projects of interest, and to direct them to the locations of the full technical reports.

GRA

N75-24524# Bureau of the Census, Washington, D.C.
STATISTICAL ABSTRACT OF THE UNITED STATES, 1974 National Data Book and Guide to Sources
William Lerner, Susan Berger, Minerva K. Moreland, Edward C. Jagers, and Ellen M. Ewell Jul. 1974 1056 p
(COM-74-51149/4; LC-4-18089; Rept-95) Avail: NTIS MF $2.25 SOD HC CSCL 05K

Statistics on the social, political, and economic organization of the United States are summarized to serve as a convenient volume for statistical reference and as a guide to other statistical publications and sources. A selection of data from many statistical publications, both governmental and private is included. Emphasis is placed on national data. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-24525 Illinois Univ., Urbana.
ON MINIMAX DECISION THEORY: A BANACH SPACE APPROACH Ph.D. Thesis
Gyorgy Hexner 1974 116 p
Avail: Univ. Microfilms Order No. 75-11691

The problems studied are models for various situations in which worst-case type estimates are desired, such as the radar tracking of hostile, evasive vehicles. A common feature of the three classes of problems discussed is that the evader's control is restricted to being open-loop (i.e., the vehicle's maneuvers are preprogrammed before the start of its motion). In the first class of problems the evader's control is any time-dependent function, while in the other two problems, either the total control energy or the total control effort is bounded. The definition of the loss function with respect to which the tracker's estimates are minimax completes the description of the problems.

Dissert. Abstr.

N75-24526*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
ZERO-GRAVITY ATMOSPHERIC CLOUD PHYSICS EXPERIMENT LABORATORY; PROGRAMMATICS REPORT
Sep. 1974 266 p
(Contract NAS8-30272)
(NASA-CR-120725; MDC-G5456) Avail: NTIS HC $8.50 CSCL 04A

The programmatics effort included comprehensive analyses in four major areas: (1) work breakdown structure, (2) schedules, (3) costs, and (4) supporting research and technology. These analyses are discussed in detail in the following sections which identify and define the laboratory project development schedule, cost estimates, funding distributions and supporting research and technology requirements. All programmatics analyses are correlated among themselves and with the technical analyses by means of the work breakdown structure which serves as a common framework for program definition. In addition, the programmatic analyses reflect the results of analyses and plans for reliability, safety, test, and maintenance and refurbishment.

Author

N75-24527# Federal Council for Science and Technology, Washington, D.C.
REPORT ON THE FEDERAL RESEARCH AND DEVELOPMENT PROGRAM, FISCAL YEAR 1976
1 Feb. 1975 171 p
(PB-239528/3) Avail: NTIS HC $6.25 CSCL 05A

Highlights of the fiscal year 1976 research and development program are presented, with emphasis, on program content rather than on budget detail. Federal agency programs are discussed, including those of the National Science Foundation and the Smithsonian Institution. Significant activities are categorized and analyzed according to the following functions: basic science, climate, energy, environment, food, health/biomedical, materials, oceans, and sociology. L.B.

N75-24528# Texas Univ., Austin. Computer-Assisted Instruction Lab.
ON-LINE MANAGEMENT INFORMATION SYSTEM FEASIBILITY IN AN R AND D ENVIRONMENT Final Report, 1 Sep. 1973 - 30 Jun. 1974
Harold F. Neil, Jr., Mary E. Walker, George H. Walther, and Wilson A. Judd Dec. 1974 83 p refs
(Contract F41609-73-C-0019; AF Proj. 7000)
(AD-A007723; AFHRL-TR-74-98) Avail: NTIS CSCL 05/1

The objectives of this study consisted of three stipulated tasks. These tasks were: (1) to conduct and document a thorough, comprehensive review of existing literature which addresses itself to implementation and evaluation of on-line data management systems; (2a) to analyze methods currently in existence within the Air Force Human Resources Laboratory (AFHRL) for processing management and planning information; and (2b) to analyze the information needs of a designated subset within the AFHRL; (3a) to develop implementation and evaluation strategies; (3b) to demonstrate and evaluate the feasibility of the strategies and techniques developed. The interim report discussed tasks (1) and (2) and provided baseline data for task (3). This final report will address itself to objective (3). GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N75-24529 Michigan Univ., Ann Arbor.
EVALUATION AND OPTIMIZATION OF FILE ORGANIZATIONS THROUGH ANALYTIC MODELING Ph.D. Thesis
Shi Bing Yao 1974 215 p
Avail: Univ. Microfilms Order No. 75-10347

A file designer system is developed that can be used by a file design system to select good file organizations from a large number of alternatives. This design system takes its requirement parameters from the data collection, user activities, and machine characteristics. The output of the design system is a suggested file structure, and the details of the actual file structure can be determined by simulation or other techniques. The generalized model that forms the basis of this system makes explicit the principles underlying data base construction. It is observed that all access mechanisms are gradually-refining processes and that they hierarchically decompose the search space. This research identifies the important relationship between the access paths and efficient operation of a data base. Dissert. Abstr.

N75-24530 Conservatoire National des Arts et Metiers, Paris (France). Lab. National D'Essais.
STUDY OF A GROUP OF DOCUMENTATION SYSTEMS IN ORDER TO DETERMINE THE INTERCONNECTION AND THE EXCHANGE POSSIBILITIES AT THE LEVEL OF SECTORIAL NETWORKS AND TO RECOMMEND THE MEANS NECESSARY FOR THIS HARMONIZATION Final Report [ETUDE D'UN ENSEMBLE DES SYSTEMES DOCUMENTAIRES EN VUE DE DETERMINER LES POSSIBILITES D'INTERCONNECTION ET D'ECHANGES AU NIVEAU DES RESEAUX SECTORIELS ET DE RECOMMANDER LES MOYENS NECESSARIES A CETTE HARMONISATION]
Citti Jul. 1974 12 p In FRENCH
(Contract DGRST-73-7-1154)
Avial: Issuing Activity

The options which have to be decided on in the formation of a sectorial network are discussed: the conception of the system free text or controlled language, the basis (thesaurus, cataloging, and information system), and the form (information exchange format). The French Cyclades computer network with MITRA 15 nodes, permitting direct access to various data bases, decentralization of data bases, and sharing of resources, is detailed. ESRO

N75-24531 Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris (France). Service de Documentation.
CONSTRUCTION OF A MONOLINGUAL THESAURUS ON ATMOSPHERIC POLLUTION Final Report [ETABLISSEMENT D'UN THESAURUS MONOLINGUE SURLA POLLUTION ATMOSPHERIQUE]
A. David Jun. 1974 202 p refs In FRENCH
(Contract DGRST-71-7-2863)
Avail: Issuing Activity

The methodology followed, the conditions of work, the work planning, and the costs of constructing a thesaurus in the French language on atmospheric pollution are detailed. Objectives were to identify the different information levels and categories and the information needs in the field, especially in industry; to permit integration into automated documentation networks; to achieve compatibility with thesauri of related fields, and, finally, to allow direct transposition into the English language. The thesaurus has been compiled by a team of experts from organizations representing the different aspects of air pollution, in conformity with the ISO/UNISIST guidelines on thesaurus construction. ESRO

N75-24532# Oak Ridge National Lab., Tenn.
NSF-RANN ENERGY ABSTRACTS. A MONTHLY ABSTRACT JOURNAL OF ENERGY RESEARCH
M. P. Guthrie, ed. Jun. 1974 88 p refs
(Contract W-7405-eng-26)
(ORNL-EIS-74-52-Vol-2-No-6) Avail: NTIS HC $4.75

The published results of work performed under the "energy research and analysis" category of RANN are cited along with other energy research results. The following areas are included: energy sources; electric power generation, supply and demand, transmission, environmental effects, and use; and energy production, consumption, supply and demand, and policy. NSA

N75-24533# Hanford Engineering Development Lab., Richland, Wash.
COMPUTER CONTROLLED DATA ACQUISITION SYSTEM FOR THE HIGH TEMPERATURE SODIUM TEST FACILITY
B. E. Dozer Nov. 1974 32 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-74-60) Avail: NTIS HC $3.75

Experiments vary in nature but, in general, are concerned with the U.S. Atomic Energy Commission's liquid metal fast breeder reactor program. Most experiments involve testing components and equipment for use in nuclear reactor service in a liquid sodium environment. To a large extent, the data come from thermocouples and standard process transmitters measuring flow, pressure, and temperature. Some special instruments such as electromagnetic flow meters and gas chromatographs are also involved. Design and operation of the system are described. NSA

N75-24534# National Materials Advisory Board, Washington, D.C.
CATALOG OF SELECTED NMAB REPORTS
Dec. 1974 46 p refs
(AD-A007358; NMAB-5-C) Avail: NTIS CSCL 05/21

The main purpose of this catalog is to acquaint the national community of materials scientists and engineers, as well as other potentially interested groups, with the studies (many of which are of broad national import) that have been pursued by the NMAB since 1964 and thereby to maximize their usefulness. Toward this end, this issue of the catalog provides a list of selected NMAB reports issued from 1964 through 1974, with an abstract of each. Materials studied include metals, minerals, ceramics, plastics, composites, and electronic components. GRA

N75-24535# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES. VOLUME 29 NUMBER 3
Waldo G. Magnuson and Victoria S. Hewitson 31 Mar. 1975 51 p refs
(AD-A007612; ESN-29-3) Avail: NTIS CSCL 05/2

The monthly publication presents articles about recent developments in European scientific research. Although this information is not a contribution to the scientific literature, it is intended to aid American scientists by reporting events and results well in advance of most of the scientific publications and trade journals. The articles are written by members of the scientific staff of ONR London. European visits of scientists from America are coordinated and invited where appropriate. Articles are also contributed by staff members of the USAF European Office of Aerospace Research and Development and the US Army Research and Development Group. GRA

N75-24536# RCA Labs., Princeton, N.J.
IMAGE DESCRIPTORS FOR DISPLAYS Technical Report, 10 Dec. 1973 - 9 Dec. 1974
Roger W. Cohen, Istvan Gorog, and Curtis R. Carlson Mar. 1975 153 p refs
(Contract N00014-74-C-0184)
(AD-A007585; PRRL-75-CR-2) Avail: NTIS CSCL 09/4

This report summarizes the results of the experimental and theoretical efforts aimed at developing new image quality descriptors suitable for performance prediction and optimization of combined display-observer systems. The approach is that of linear systems analysis, using the methodology of statistical communications theory. The authors treat the processes of image display and perception in statistical terms and predict the most probable performance of the overall observer-imaging system. This report contains a number of important new results concerning the statistical properties of natural scenes, a complete, new, statistical treatment of the one-dimensional image sampling

problem, a new descriptor suitable for the analysis of the perceived sharpness of two-dimensional analog (nonsampled) displays having nonisotropic point-spread functions, and data obtained from a set of psychophysical measurements aimed at the quantitative understanding of the two-dimensional sine wave response of human visual perception. The authors also report the development of a real-time optical block image processor that was developed for use for the experimental testing of our theoretical results. GRA

N75-24537# Syracuse Univ., N.Y. Dept. of Industrial Engineering and Operations Research.
A DISCRETE SIMULATION MODEL OF THE REVISED AFMPC IOC MICROFORM SYSTEM Interim Report
Vijay Trehan and Robert G. Sargent Feb. 1975 88 p refs
(Contract F30602-74-C-0335)
(AD-A007776; RADC-TR-75-23) Avail: NTIS CSCL 09/2

A SIMSCRIPT-II.5 simulation model of the revised Air Force Military Personnel Center (AFMPC) Initial Operating Capability (IOC) Microform System being developed by Rome Air Development Center (RADC) is described. This model will allow different workloads and system configurations to be analyzed for system design, for scheduling of different workloads, and for aiding in the evaluation and testing of the actual system once it is in operation. GRA

N75-24538# National Science Foundation, Washington, D.C. Student-Originated Studies Program.
ABSTRACT REPORTS: PRESENTED AT THE MEETINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, MAY - DECEMBER 1972
Berton F. Hill Dec. 1972 456 p refs Conf. held at Washington, D. C., 26-28 Dec. 1972
(PB-239274/4; NSF-73-20) Avail: NTIS HC $11.50 CSCL 05B

The abstracts cover the findings of 134 college and university research projects conducted in 1972, plus the names of each student project director, faculty project advisor and the participants. Each project dealt with the scientific or technological aspects of a socially relevant problem. The abstracts will aid in identifying projects of interest, and direct interested persons to the locations of the full technical reports. GRA

N75-24539# Mitre Corp., McLean, Va.
NATIONAL ENERGY FLOW ACCOUNTS
J. Just, B. Borko, and J. Morris Sep. 1974 206 p refs
(Contract NSF GI-14024)
(PB-239275/1; MTR-6753; NSF/RA/N-74-189) Avail: NTIS HC $7.25 CSCL 05B

A comprehensive, integrated framework for structuring energy data of many types was developed. This set of National energy accounts is designed to be integrated with the National economic accounts and other major data bases. This report outlines the overall concept of four major interlocking accounts dealing with energy flow, energy technology, energy resources and other data. The energy flow account consists of seven subaccounts on energy sources, energy uses, interindustry energy flows, energy prices, energy transportation, energy distribution, and energy supply and demand time profiles. The structure of these accounts is fixed but the level of detail is flexible so that data could be utilized in different degrees of aggregation. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-24540# Bureau of International Commerce, Washington, D.C.
COUNTRY MARKET SURVEY. AVIONICS AND AVIATION SUPPORT EQUIPMENT, AUSTRALIA
Jan. 1975 12 p
(COM-75-50072-017; CMS-75-017) Avail: NTIS HC $3.25 CSCL 05C

Australia's economic prosperity in the 1970's and the accompanying upsurge in demand for air services linking cities and production areas with each other and with points abroad are discussed. The leading air carriers response with major fleet expansion programs to undergird solid growth in the avionics and aviation support equipment market between 1975 and 1979 is outlined. Forecasts place the market for avionics equipment alone at more than $30 million for the 1979 fiscal year, representing an increase of nearly 40% over the $22.4 million estimated for 1974. GRA

N75-24541# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
THE ECONOMIC AND ENVIRONMENTAL BENEFITS FROM IMPROVING ELECTRICAL RATE STRUCTURES Final Report
Mark Sharefkin Nov. 1974 191 p refs
(Contract EPA-68-01-1850)
(PB-239451/8; JACKFAU-101-74; EPA-600/5-74-033) Avail: NTIS MF $2.25; SOD HC $7.00 as EP1.23/2:600/5-74-033 CSCL 05C

Quantitative estimates of the internal cost savings to be derived from changes in the pricing of electric power are devised and evaluated. The econometric literature on electricity demand is surveyed, and elasticity values are selected which are parameters for the overall benefit measures. A method for using reported utility data to estimate the cost of delivered power--at the system peak and off the system, and for each customer class--is devised. Data on five electric utilities is used to make estimates of the potential benefits from improvements in the pricing of electric power, for each customer class in each system. The estimated potential benefits are sufficiently large to merit load curve studies by block for residential customers. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-24542# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS FOR 1976. PART 2: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1975 889 p refs Hearings before a Subcomm. of the Comm. on Appropriations, 94th Congr., 1st Sess., 4 Mar. 1975
(GPO-51-423) Avail: Comm. on Appropriations

Testimony is provided in support of NASA's budget request for fiscal year 1976. The details of various aeronautics and space programs are discussed in terms of their contribution to the advancement of knowledge and technology and to solving problems in the areas of energy, pollution, and inflation. A budget which allows the continuation of existing programs but no new program starts is presented. J.M.S.

N75-24543*# Texas Univ., Houston. Health Science Center.
URBAN ENVIRONMENTAL HEALTH APPLICATIONS OF REMOTE SENSING, SUMMARY REPORT
Marjorie Rush, J. Goldstein, B. P. Hsi, and Calvin. B. Olsen Jan. 1975 66 p refs Original contains color illustration

(Contract NAS9-12823)
(NACA-CR-141788) Avail: NTIS HC $4.25

Health and its association with the physical environment was studied based on the hypothesis that there is a relationship between the man-made physical environment and health status of a population. The statistical technique of regression analysis was employed to show the degree of association and aspects of physical environment which accounted for the greater variation in health status. Mortality, venereal disease, tuberculosis, hepatitis, meningitis, shigella/salmonella, hypertension and cardiac arrest/myocardial infarction were examined. The statistical techniques were used to measure association and variation, not necessarily cause and effect. Conclusions drawn show that the association still exists in the decade of the 1970's and that it can be successfully monitored with the methodology of remote sensing. Author

N75-24544*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SYSTEM ANALYSIS OF A PISTON STEAM ENGINE EMPLOYING THE UNIFLOW PRINCIPLE, A STUDY IN OPTIMIZED PERFORMANCE
Jerry A. Peoples May 1975 76 p refs
(NASA-TM-X-66818; M-TU-75-5) Avail: NTIS HC $4.75 CSCL 21G

Results are reported which were obtained from a mathematical model of a generalized piston steam engine configuration employing the uniflow principal. The model accounted for the effects of clearance volume, compression work, and release volume. A simple solution is presented which characterizes optimum performance of the steam engine, based on miles per gallon. Development of the mathematical model is presented. The relationship between efficiency and miles per gallon is developed. An approach to steam car analysis and design is presented which has purpose rather than lucky hopefulness. A practical engine design is proposed which correlates to the definition of the type engine used. This engine integrates several system components into the engine structure. All conclusions relate to the classical Rankine Cycle. Author

N75-24545# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
DESIGN OF HIGH SPEED MOVING PAVEMENTS FOR MASS TRANSIT
A. Mehmi and K. B. Ayers Oct. 1974 151 p refs
(TT-7410) Avail: NTIS HC $6.25

Problems of urban transportation and user requirements for high speed moving pavements, including current concepts and safety factors, are discussed. A preliminary engineering study of a passenger accelerating device using gravity to produce an acceleration from 2 mph step-on speed to 8 mph cruising speed was devised. A system of lenticular pallets, concave and convex in alternate positions, was designed to provide the riding platform. A scale model was developed. The design of tracks, the ability of the system to execute horizontal curving, and a preliminary design solution for the drive systems are also included. ESRO

N75-24546*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REGIONAL ENVIRONMENTAL ANALYSIS AND MANAGEMENT: NEW TECHNIQUES FOR CURRENT PROBLEMS
R. B. Honea (ORNL) and C. T. N. Paludan 1974 10 p refs Presented at the Intern. Geol. Union Regional Conf., Palmerston North, New Zealand, 4-11 Dec. 1974 Sponsored by NSF and ERDA
(NASA-TM-X-66813; Conf-741216-1) Avail: NTIS HC $3.25 CSCL 09D

Advances in data acquisition and processing procedures for regional environmental analysis are discussed. Automated and semi-automated techniques employing Earth Resources Technology Satellite data and conventional data sources are presented. Experiences are summarized. The ERTS computer compatible tapes provide a very complete and flexible record of earth resources data and represent a viable medium to enhance regional environmental analysis research. GRA

N75-24547# Massachusetts Inst. of Tech., Cambridge. School of Engineering.
EVALUATION OF POLICY RELATED RESEARCH IN THE FIELD OF MUNICIPAL SOLID WASTE MANAGEMENT Final Report
James F. Hudson, Frederick P. Gross, David Gordon Wilson, and David H. Marks Sep. 1974 388 p refs
(Grant NSF GI-39278)
(PB-239375/9; R74-56; NSF/RA/S-74-009) Avail: NTIS HC $10.25 CSCL 13B

An evaluation was made of research on local solid waste management problems. The work is one of a series of projects and is primarily concerned with residential waste. Research in the solid waste field is discussed and evaluated, and information is given on the accuracy, availability, and potential usefulness of the research results. A complete bibliography is included. The presentation is structured into several areas related to issues of concern to local system managers, owners, and elected officials, including the choice of type of service to be provided, the setting of work procedures, productivity, regionalization, scale of system operation, and the choice of technology for collection, processing, and disposal. GRA

N75-24548# Kentucky Dept. of Highways, Lexington. Div. of Research.
SLOPE STABILITY ANALYSIS: A COMPUTERIZED SOLUTION OF BISHOP'S SIMPLIFIED METHOD OF SLICES Interim Report
S. M. Yoder and T. C. Hopkins Feb. 1973 73 p refs
(PB-238954/2; RR-358) Avail: NTIS HC $4.25 CSCL 13B

A computer program capable of analyzing the slope stability of a multilayered soil mass is described. The computer program was specifically developed for analyzing the slope stability of highway bridge approach embankments; however, it can be applied to a broad spectrum of practical slope configurations and bearing capacity problems. Details of the use, applications, and accuracy of the program are presented. Important features of the computer program include a grid type, search operation for locating the critical shear surface and a ledger printout of the forces acting on each individual slice. GRA

N75-24549# Federal Highway Administration, Washington, D.C. Office of Highway Planning.
HIGHWAY TRAVEL FORECASTS
Gary Maring Nov. 1974 69 p refs
(PB-239169/6) Avail: NTIS HC $4.25 CSCL 13B

A study to reevaluate national highway travel forecasts is reported in light of such factors as declining birth rates, possible saturation of vehicle ownership, and fuel constraints. Since highway travel is expected to increase at an annual compound rate of 2 to 3 percent per year to 1990, travel projections are based on anticipated increases in population, licensed drivers, vehicles, and personal income. Even with constraints on fuel the projections appear reasonable assuming continued increases in the fuel efficiency of the vehicle fleet. GRA

N75-24550# National Academy of Sciences - National Research Council, Washington, D.C.
SCIENTIFIC AND TECHNICAL INFORMATION NEEDS AND RESOURCES IN THE REPUBLIC OF CHINA (TAIWAN)
1974 86 p refs Presented at the Sino-US Workshop, Washington, D.C., 24-26 Apr. 1973
(PB-239492/2) Avail: NTIS HC $4.75 CSCL 05B

The National Academy of Sciences - National Research Council and the Academie Sinica of the Republic of China jointly sponsored a workshop on the Scientific and Technical Information Needs and Resources of the Republic of China (Taiwan) from 16 April to 14 May, 1973. Purposes of workshop were: (1) to identify the needs for S and T information in Taiwan and the resources required to meet them; (2) to examine and make recommendations that Taiwan might take to strengthen its national scientific and technical information infrastructure, and to establish linkages with information sytems, centers, and services in other countries and; (3) to identify areas for future cooperative efforts between counterpart U.S. and Chinese institutions. GRA

N75-24551# Metropolitan Transportation Commission, Berkeley, Calif.
THE DETERMINATION AND EVALUATION OF OBJECTIVE ACCESS TIMES TO PUBLIC TRANSIT FOR DISAGGREGATE

TRAVELER BEHAVIOR MODELING
Fred A. Reid Nov. 1974 59 p refs
(Contract DOT-OS-30176)
(PB-239212/4; MTC-TM-10-15-74) Avail: NTIS HC $4.25 CSCL 13B

The paper investigates methods of overcoming the deficiency of zonal aggregate transit network data for representing local walk access variations. Alternative methods of determining transit access in a real setting are reduced to five, based on modifications of transit network coding procedures. These are evaluated by comparison with values from travelers' reports, bus time tables, and zonal networks. A method of manually coding alternative access links from known individual trip-ends to standard network nodes is found to give a four-to-one improvement in the resulting walk access variance of a trip sample compared to an inter-zonal representation access for the trips. Numerous other sources of differences between calculation methods and reports for all components of a transit trip were investigated. GRA

N75-24552# Michigan Technological Univ., Houghton.
SOCIO-PSYCHOLOGICAL ASPECTS OF TRANSPORTATION, A BACKGROUND/RESOURCE PAPER FOR THE UPPER GREAT LAKES UNIVERSITY CONSORTIUM FOR TRANSPORTATION RESEARCH Final Report
Robert Kulisheck Sep. 1973 45 p refs Prepared in cooperation with Upper Great Lakes Univ. Consortium for Transportation
(Contract DOT-OS-30096)
(PB-238938/5; DOT/TST-75-35) Avail: NTIS HC $3.75 CSCL 13B

Contents: social science and transportation research; cost-benefit analysis; the policy evaluation model; the experimental model; the process oriented qualitative model; social impacts of transportation policies; psychological impacts of transportation policies; dial-a-ride transportation systems; decentralized medical care delivery systems; a socio/environmental impact analysis of the proposed development of U.S. Highway 2; pilot survey--feasibility of DART system in superior, Wisconsin; and underdeveloped project ideas. GRA

N75-24553# Stanford Research Inst., Menlo Park, Calif.
IMPROVED SUPPRESSION OF RADIATION FROM AUTOMOBILES USED BY THE GENERAL PUBLIC Final Report
Donald L. Nielson, James C. Gaddle, and Richard A. Shepherd Jan. 1975 160 p refs
(Contract FCC-0072; SRI Proj. 2763)
(PB-239471/6; FCC-OCE-75-RS-03) Avail: NTIS HC $6.25 CSCL 13F

The incidental electromagnetic radiation from an automobile that is termed ignition noise is caused by fast-rise-time (impulsive) currents that flow in the vehicle's wiring. Concepts were developed and prototypes were built and tested for incorporating simple low-pass filters directly into the spark plug (by appropriate sizing of the plug's shell and inner electrode) and into the distributor. The intent of this work was to take an individual vehicle with its noise already suppressed by the techniques used in mass production in the United States, a vehicle selected as being the quietest among a group of similarly treated vehicles, and to improve its noise suppression by 10 db over the frequency range 30 to 500 MHz. GRA

N75-24554# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
HYDROPLANING AND TREAD PATTERN HYDRODYNAMICS Interim Report
James F. Sinnamon and John T. Tielking Oct. 1974 132 p refs
(PB-239504/4; UM-HSRI-PF-74-10; IR-7) Avail: NTIS HC $5.75 CSCL 13F

The document presents the final report on analytical and laboratory studies directed toward the development of a set of tire performance parameters containing the aspects of tread pattern geometry which are relevant to water expulsion effectiveness. Current knowledge of the hydroplaning phenomenon is reviewed and utilized in interpreting the results of laboratory experiments designed to measure the water explusion effectiveness of a tread pattern. GRA

88 SPACE SCIENCES (GENERAL)

N75-24555# European Space Research Organization, Paris (France).
H2 REGIONS AND THE GALACTIC CENTRE
A. F. M. Moorwood, ed. Nov. 1974 292 p refs Proc. of the 8th ESLAB Symp., Frascati, Italy, 4-7 Jun. 1974
(ESRO-SP-105) Avail: NTIS HC $8.75

Results obtained from ground-based and balloon-borne telescope observations of H2 regions and the galactic center are presented and interpreted. Molecular clouds and star formation are discussed. For individual titles, see N75-24556 through N75-24591.

N75-24556 Kitt Peak National Observatory, Tucson, Ariz.
THE ORION NEBULA: A PHOTOGRAPHIC STUDY OF SPATIAL STRUCTURE c89
T. R. Gull *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 1-11 refs Sponsored by NSF (For availability see N75-24555 15-88)

The structure of the neutral and ionized regions of the Orion nebula is described as recorded on direct photographic plates through selected interference filters. Seven of the plates, which were exposed at the prime focus station of the Mayall telescope are reproduced. Differences in structure are noted in the continuum, H alpha + (N 2), (S 2), and H beta exposures. The geometry and variations of the structure plus polarization information leads to the conclusion that much of the outer region of the Orion nebula is reflection nebula. Author (ESRO)

N75-24557 Centre National de la Recherche Scientifique, Meudon (France). Dept. of Fundamental Astrophysics.
OPTICAL OBSERVATIONS OF A FEW SMALL H2 REGIONS DETECTED AT INFRARED WAVELENGTHS c89
Marie-Claire Lortet-Zuckermann *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 13-17 refs (For availability see N75-24555 15-88)

Several observational results on the density and brightness distribution across obscure lanes in small H alpha nebulae are discussed. The peak density is often shifted by a distance of the order of 0.1 pc from the brightness boundary towards the obscure region. The relation with infrared sources is briefly discussed. Author (ESRO)

N75-24558 Consiglio Nazionale delle Ricerche, Frascati (Italy). Lab. di Astrofisica Spaziale.
NGC 7635 AND ITS STELLAR NUCLEUS c89
Roberto Viotti and Roberto Nesci *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 19-22 refs (For availability see N75-24555 15-88)

Observational results concerning NGC 7635 are discussed with special regard to the infrared data. Spectroscopic investigations made at the Asiago and Dominion Astrophysical Observatories show that the exciting star has an O6f spectral type. The emissions are probably variable; the line broadening corresponds to a rotational velocity v sin i = 240 km/s. Author (ESRO)

N75-24559 Sussex Univ., Brighton (England). Astronomy Centre.
OPTICAL, INFRARED AND RADIO OBSERVATIONS OF TWO H2 REGIONS c89
M. J. Barlow, M. Cohen (Calif. Univ., Berkeley), and T. R. Gull (Kitt Peak Natl. Obs.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 23-33 refs (For availability see N75-24555 15-88)

A series of broad and narrow-band photographs of the H 2 regions NGC 7635/Sh 162 and IC 1470 are presented. In addition to the well-known bubble, a second shell is found to be present in NGC 7635/Sh 162. A 5 GHz map showing the large scale structure of NGC 7635/Sh 162 is presented. The nebular continuum was measured at several places in each nebula and is shown to be due to dust-scattered starlight. From the scattered-light continuum observations and the variations in extinction found in both nebulae, a very inhomogeneous dust

distribution is found. The relation of the exciting stars to the observed infrared emission is discussed. Author (ESRO)

N75-24560 Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
COMPACT INFRARED SOURCES ASSOCIATED WITH SOUTHERN H2 REGIONS c89
Jay A. Frogel and S. Eric Persson *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 35-37 Submitted for publication Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-24555 15-88)

Maps were presented of five bright, compact infrared sources associated with eleven galactic H 2 regions. RCW 57/IRS 1, an unresolved source, exceptionally bright at 4.8 micrometer, may be a protostar. A similar object may be embedded in RCW 38/IRS 1. The 1.25 micrometer luminosity of the single component source G298.2-0.3 is the highest of any known in the H 2 region. The exciting star (RCW 38/IRS 2) was detected in one source. ESRO

N75-24561 Hale Observatories, Pasadena, Calif.
INFRARED OBSERVATION OF NGC 6334 c89
E. E. Becklin and G. Neugebauer *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 39-42 refs (For availability see N75-24555 15-88)

Infrared photometric observations of three components in NGC 6334 were made. Two of the components are associated with compact H2 regions and are similar to the sources in W3. The third component is almost coincident with the OH maser source and shows no known radio continuum emission. A component of the infrared emitting region is less than 1 inch in diameter at 10 microns and shows a strong silicate dust absorption feature. In many respects, this source is very similar to the BN infrared source in the Orion nebula. Author (ESRO)

N75-24562 University Coll., London (England). Dept. of Physics and Astronomy.
RECENT OBSERVATIONS OF THE 8-13 MICRON SPECTRA OF H2 REGIONS c89
D. K. Aitken, B. Jones, and J. Penman *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 43-48 refs (For availability see N75-24555 15-88)

Spectral observations were carried out using the INT, Radcliffe and Tenerife telescopes and the UCL grating spectrometer. The 8 - 13 micron spectra of a number of compact H 2 regions are consistent with a simple model of a warm source surrounded by a cold envelope of obscuring material. The same absorption curve applies to the emitting and absorbing matter and appears to be independent of the particular source. Ionized neon was detected in the galactic center source Sgr A (West), confirming the thermal nature of this source; the neon abundance appears to be normal. Author (ESRO)

N75-24563 Kapteyn Astronomical Lab., Groningen (Netherlands).
ON THE STRUCTURE OF M17S c89
C. D. Andriesse and J. Koornneef *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 49-51 refs Prepared jointly with European Southern Obs. (For availability see N75-24555 15-88)

The behavior of the 9.7 micron band due to dust particles was studied for some positions within M17S. This source is probably ultraviolet-photon-bounded, with cool dust in front. Author (ESRO)

N75-24564 Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
WIDE BEAM MEASUREMENTS OF H2 REGIONS IN THE INFRARED c89
D. Lemke *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 53-59 refs (For availability see N75-24555 15-88)

Several of the brighter and more extended H 2 regions in the far infrared of the Omega nebula 1417 as seen at 21 micrometers were studied. For this type of observation, a small telescope can be used: most measurements were made with a 28 inch telescope, and occasionally a 60 inch was used. Because of the combination of the poor 21 micrometer window, large beam diameter, and a large chopper throw, sensitivity was severely limited by sky noise. Results in the form of contour maps and radio continuum maps are discussed. ESRO

N75-24565 University Coll., London (England). Dept. of Physics and Astronomy.
FAR INFRARED PHOTOMETRY OF H2 REGIONS c89
I. Furniss, R. E. Jennings, and A. F. M. Moorwood *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 61-68 refs Sponsored in part by Sci. Res. Council (For availability see N75-24555 15-88)

Broadband 40 - 350 micron fluxes are presented for 56 sources observed with a balloon-borne telescope. Within the estimated pointing accuracy, all of these sources can be identified with H 2 regions. The measured fluxes, together with available radio continuum data, were used to investigate further the relationship between infrared and radio flux and to estimate effective dust absorption depths and dust-to-gas ratios within the ionized regions. Author (ESRO)

N75-24566 University Coll., London (England). Dept. of Physics and Astronomy.
FAR INFRARED OBSERVATIONS OF W51 AND THE GALACTIC CENTRE c89
J. A. Alvarez, I. Furniss, R. E. Jennings, K. J. King, and A. F. M. Moorwood *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 69-78 refs Sponsored in part by Sci. Res. Council (For availability see N75-24555 15-88)

Spectral observations of W51 as well as maps of W51 and the galactic center region in the 40 - 350 micron band obtained from observations with a 40-cm diameter balloon-borne telescope system are presented and discussed. Author (ESRO)

N75-24567* Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
HIGH-RESOLUTION MAPS OF H2 REGIONS AT FAR-INFRARED WAVELENGTHS c89
G. G. Fazio, D. E. Kleinmann, R. W. Noyes, E. L. Wright, M. Zeilik, II, and F. J. Low (Arizona Univ., Tucson) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 79-85 refs Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-24555 15-88)
(Grant NGR-22-007-270)
CSCL 03A

The first successful flight of a balloon-borne 1-m telescope for far-infrared (>40 micron) astronomy occurred on 4 February 1974 (UT), from Palestine, Texas. During 6 h at float altitude, the gyrostabilized telescope mapped the intensity of far-infrared radiation from the H 2 regions Ori A and W3 with a resolution of 1 prime. Partial maps of these regions were made with a resolution of 0.5 prime. These sources were resolved into several components, some of which were previously unknown. Observations of Mars were used for calibration. Author (ESRO)

N75-24568 Queen Mary Coll., London (England).
ONE MILLIMETER OBSERVATIONS OF H2 REGIONS c89
P. E. Clegg and P. A. R. Ade *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 93-99 refs (For availability see N75-24555 15-88)

Results of 1mm broadband observations of five H2 regions were used in conjunction with measurements made nominally at 350 microns to establish a mean spectral index in the submillimeter region. Because of the relatively weak flux reaching the detector in this region, wide passboards are generally used for these observations. It is known that this presents problems both in calibration and in determination of the mean wavelength of observation. In particular, atmospheric conditions have a considerable effect on observation around 350 microns. Taking these effects into account, the submillimeter spectral index of the regions observed is believed to be about 3. A very simple dust emission model for the sources is also considered, and a temperature is estimated for the dust. This makes it possible to estimate the total dust mass which, for a source of spectral index 3, is independent of grain size. ESRO

N75-24569* Lockheed Missiles and Space Co., Palo Alto, Calif.
NEW OBSERVATIONS OF H2 REGIONS AT 7.875, 15.5, 31.4, OR 85 GHz c89

Hugh M. Johnson *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 103-110 refs (For availability see N75-24555 15-88)
(Contracts NAS2-7842; NAS5-23340)
CSCL 03A

Observations of about 36 regions are presented as a table of flux densities in one to four frequencies, and also as maps of selected regions, or as spectral displays. Comments are also made on most of the material, especially as it relates to previously published data in various frequencies including the infrared.
Author (ESRO)

N75-24570 Mullard Radio Astronomy Observatory, Cambridge (England). Cavendish Lab.
HIGH-RESOLUTION RADIO OBSERVATIONS OF THE SOURCES NEAR K3-50 **c89**
Stella Harris *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 111-115 refs Sponsored by Sci. Res. Council (For availability see N75-24555 15-88)

The group of radio sources near the optical object K3-50 was observed at 5 GHz with the Cambridge 5 km telescope. Two of the sources show high density compact structure, the one coincident with K3-50 itself having an unusually high brightness temperature. Radio infrared and optical observations of these sources are compared.
Author (ESRO)

N75-24571 Leiden Univ. Observatory (Netherlands). Huygens Lab.
A HIGH-RESOLUTION STUDY OF THE H2 REGION W 3(OH) **c89**
R. H. Harten *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 117-120 refs (For availability see N75-24555 15-88)

Radio telescope observations of the H 2 region W 3(OH) at 6, 21 and 50 cm wavelength indicate that it is a complex of compact sources embedded in a diffuse extended source.
Author (ESRO)

N75-24572 Nuffield Radio Astronomy Labs., Jodrell Bank (England).
RADIO RECOMBINATION LINES FROM CARBON AND HEAVIER ELEMENTS FROM THE DIRECTION OF NGC 2024 **c89**
L. Hart and A. Pedlar *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 121-123 refs (For availability see N75-24555 15-88)

Observations of the 166 alpha line are reported in order to confirm previous recombination line emissions which could correspond to an element or elements with mass greater than carbon in the 157 alpha and 158 alpha (18 cm wavelength) radio recombination lines.
ESRO

N75-24573 Leiden Univ. Observatory (Netherlands).
OH AND THE EARLIEST EVOLUTION OF H2 REGIONS **c89**
H. J. Habing *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 127-134 refs (For availability see N75-24555 15-88)

The continuum radiation near 13 type 1 OH masers, whose position was determined previously to within a few arc seconds, was mapped. Both ON1 and ON2 were included in the maser samples. The Westerbork Radio Telescope was used for this purpose at 6 and 21 cm. Isolated objects were also observed with the 100m Effelsberg (Bonn) telescope at 2.8 cm. It was found that compact H2 regions have a tendency to cluster on several scale sizes. The OH masers may coincide to within a few arc seconds with compact H2 regions. No OH masers were found to coincide with visible compact H2 regions such as K3-50.
ESRO

N75-24574 California Univ., Santa Cruz. Lick Observatory Board of Studies in Astronomy and Astrophysics.
AN EMPIRICAL MODEL FOR THE STRUCTURE OF THE ORION NEBULA **c90**
Bruce Balick, R. H. Gammon (Natl. Radio Astronomy Obs., Charlottesville, Va.), and R. M. Hjellming (Natl. Radio Astronomy Obs., Charlottesville, Va.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 135-143 refs (For availability see N75-24555 15-88)

An empirical model of the Orion nebula is proposed whereby a high-density core of ionized gas surrounding the exciting star theta 1 C is partially imbedded on the near side of a massive neutral complex. Radiation from theta 1 C continually ionizes the dense neutral gas, and a network of flows from behind the star and from the north and east result; these resupply high density gas to the core. The gas freely expands in the other directions where possible through fragments of the original neutral complex producing an extended region of tenuous, swirling nebulosity. It is shown that such a model can explain the large amount of information pertaining to the spatial and kinematic structure of this nebula.
Author (ESRO)

N75-24575 Padua Univ. (Italy). Asiago Astrophysical Observatory.
NUCLEI AND H2 REGIONS IN SPIRAL GALAXIES: PRELIMINARY RESULTS FOR M 101 **c89**
P. Benvenuti and S. DOdorico *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 145-150 refs (For availability see N75-24555 15-88)

The relative intensities of the emission lines H alpha, lambda 6584 of (NII), lambda-lambda 6717,6731 of (S2) for the nucleus, and 10 H2 regions of M101 are given. From the (S2) lines ratio, it was found that Ne = 3000/cu cm in the nucleus, while Ne is less than 1000/cu cm in the H2 regions. The presence of a peculiar structure in the nucleus is revealed. Physical conditions and N/S abundance ratio in the H2 regions are very close to those obtained for M33. An upper limit for the surface brightness of the interarm area of M101 was established.
ESRO

N75-24576* State Univ. of New York, Albany.
EVOLUTIONARY CHARACTERISTICS OF A BIMODAL GRAIN MODEL **c90**
J. Mayo Greenberg and Soo Hong Seung *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 153-162 refs Prepared jointly with Dudley Obs. (For availability see N75-24555 15-88)
(Grant NGR-33-011-043)
CSCL 03B

A bimodal model of interstellar grains consisting of silicate cores of size approximately 0.06 micron with modified ice mantles of approximately 0.1 micron and very small particles of silicate and/or graphite of size approximately 0.005 micron is followed through various stages of evolution. Starting with a distribution of core-mantle cylinders producing average wavelength dependence of polarization and extinction, changes in physical and optical characteristics of the model are studied going first into regions of dense cloud condensation and coming out at the other end of star formation into young H2 regions. Physical justification is presented to show that not only in dense clouds must the core mantle grains be larger than normal, but also in young H2 regions.
Author (ESRO)

N75-24577* Consiglio Nazionale delle Ricerche, Frascati (Italy). Lab. di Astrofisica Spaziale.
DUST IN H2 REGIONS **c90**
Nino Panagia *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 163-171 refs Sponsored in part by NASA and ESRO (For availability see N75-24555 15-88)
(Grant NSF GP-36426X)
CSCL 03B

The effects of dust inside H2 regions were studied by means of theoretical models of dusty nebulae. Infrared observations were analyzed and clear evidence was found that the emitting dust is mostly mixed with the ionized gas. Some information about the amount, distribution, and properties of dust grains was also derived.
Author (ESRO)

N75-24578* Stanford Univ., Calif. Inst. for Plasma Research.
IONISATION STRUCTURE AND TRANSFER OF RADIATION IN DUSTY NEBULAE **c90**
Vahe Petrosian *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 173-178 refs Sponsored in part by Alfred P. Sloan Found. (For availability see N75-24555 15-88)
(Grant NGR-05-020-510)
CSCL 03B

Analytic expressions describing the infrared radiation and

hydrogen to helium line intensity ratios from a dusty nebula are presented. Implications of these results are discussed briefly.
Author (ESRO)

N75-24579* Cornell Univ., Ithaca, N.Y. Centre for Radiophysics and Space Research.
EXPECTED FAR INFRARED POLARIZATION OF H2 REGIONS AND THE NUCLEI OF GALAXIES **c90**
Martin Harwit *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 179-184 refs (For availability see N75-24555 15-88)
(Grant NGR-33-010-172)
CSCL 03B

The expected polarization of far infrared sources is discussed, and it is shown that the observed degree of polarization generally depends on two factors: (1) the availability of a mechanism that can produce polarization, and (2) the gain in polarization which absorption or stimulated emission can produce within a source. It is pointed out that stimulated emission could produce sizeable gain changes in compact dust clouds such as those associated with H2 regions and possibly also in dense regions exhibiting OH and H2O masers. Whether such a gain can actually become positive (maser-like behavior) is not clear, but this would in any case depend on the chemical structure of the grain material and the spectral range of interest. Author (ESRO)

N75-24580 Observatoire de Paris-Meudon (France).
CALCULATION OF INFRARED SPECTRA FROM DUST IN PLANETARY NEBULAE **c90**
N. Epchtein, E. Bussoletti (Lecce Univ., Italy), and J. P. Baluteau *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 185-190 refs (For availability see N75-24555 15-88)

Calculations of dust grain temperature in planetary nebulae were performed, using an improved method applied to graphite core-ice mantle, carbonates, and silicates. The spectra of several nebulae were calculated with these values of grain temperature and compared with experiments. It is concluded that it is necessary to set grains inside the H2 region to interpret the observations. Most of the Lg alpha flux can escape the H2 region and may heat dust in the H1 region. The measurements at 20 micrometer can be interpreted as stemming partly from this cold component. ESRO

N75-24581 Osservatorio Astrofisico di Arcetri, Florence (Italy).
THE GAS-TO-DUST RATIO IN THE ORION NEBULA **c89**
M. Perinotto and P. Patriarchi *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 191-194 refs (For availability see N75-24555 15-88)

About 60 spectra were obtained using an image tube with the nebular spectrograph of the Asiago 122 cm reflector, in a position W-E from north of the Trapezium across the star P1925 into the bay area of the Orion nebula. Twenty-five spectra were selected for accurate measurements of the H beta intensity and of the electron density by the (S2) 6730/6716 intensity line ratio. The results are interpreted in terms of well-mixed gas and dust, not only in the central bright regions, but even in the bay area, where the coefficient of dust extinction counted per electron is found to be larger than in the bright center of the nebula.
Author (ESRO)

N75-24582 State Univ. of New York, Stony Brook. Dept. of Earth and Space Sciences.
CARBON MONOXIDE MAPPING OF 100 MICROMETER SOURCES ASSOCIATED WITH DARK CLOUDS: PRELIMINARY RESULTS **c89**
M. Simon and M. N. Simon (Brookhaven Natl. Lab.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 203-207 refs (For availability see N75-24555 15-88)

Since molecules seem to be associated with regions of dust and gas, a program was initiated of CO mapping observations of 100 microns sources that were detected in the several airborne surveys in order to study the temperature, optical depth, and excitation conditions in these sources. The first sources to be mapped were HFE 2, 9, 10, and 11 and FJM 3. CO was found at or near all the 100 microns sources (with the exception of HFE 10 and 11), and the sources appear to be associated with small dark clouds. Author (ESRO)

N75-24583 University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
STAR FORMATION AND CONTRACTION/FRAGMENTATION PROBLEMS **c90**
A. P. Whitworth *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 209-220 refs Sponsored in part by Sci. Res. Council and North Atlantic Treaty Organ. (For availability see N75-24555 15-88)

The processes that determine the mass spectrum and spatial configuration of stars formed in association are discussed, the processes are evaluated in terms of the energy imbalance which drives them and the competitivity of their time scale. A trend in the contraction/fragmentation sequence is outlined. This trend derives from the interaction between magnetic and centrifugal forces. The condensation time scale problem is considered.
Author (ESRO)

N75-24584* State Univ. of New York, Albany.
DUST IN THE GALACTIC CENTER **c89**
J. Mayo Greenberg and Soo Hong Seung *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 221-225 refs Prepared jointly with Dudley Obs. (For availability see N75-24555 15-88)
(Grant NGR-33-011-043)
CSCL 03B

The strength of the 9.7 microns absorption band in the radiation from the galactic center is used to deduce a range of measures of the visual extinction from 20 to 400 magnitudes. A possible way of arriving at a unique value of the visual extinction consistent with variations in the wavelength dependence of extinction as a function of grain characteristics is indicated. The mass of silicates deduced from the 9.7 microns band appears to imply a gradient of metallicity towards the galactic center.
Author (ESRO)

N75-24585 Kapteyn Astronomical Lab., Roden (Netherlands).
THE DOMINANT 10 TO 20 MICROMETER SOURCE IN THE GALACTIC CENTRE **c89**
J. Borgman, J. Koornneef, and M. deVries *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 229-233 refs Prepared jointly with European Southern Obs. (For availability see N75-24555 15-88)

The dominant 10 - 20 microns source in the galactic center is a 4' x 6' object, coinciding with a compact radio source. It is suggested that the radiation is due to dust, which competes efficiently with the hydrogen to capture Lyman-continuum photons, or that the dust is heated by protostars which are just becoming hot enough to start ionizing the hydrogen. Author (ESRO)

N75-24586 Kapteyn Astronomical Lab., Groningen (Netherlands).
MULTICOLOUR FAR-INFRARED PHOTOMETRY OF THE GALACTIC CENTRE REGION **c89**
H. Olthof *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 235-238 refs Sponsored by Dutch Roy. Acad. of Sci. (For availability see N75-24555 15-88)

Observations were made in two wavelength bands, simultaneously, during balloon flights conducted in the south of France in 1972 and 1973. Author (ESRO)

N75-24587 Kapteyn Astronomical Lab., Groningen (Netherlands).
INFRARED RADIATION MODEL FOR THE GALACTIC CENTRE **c90**
C. D. Andriesse *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 239-245 refs (For availability see N75-24555 15-88)

A model is discussed which details the general view that the infrared radiation from the galactic center region originates from interstellar dust heated by stellar radiation. Its ingredients are the stellar mass model for the galactic center, and Spinrad's model for the stellar population in the nucleus of M31. A simple theoretical oscillator model is used for the infrared radiative properties of dust particles. Some qualitative remarks are made regarding the treatment and its approximations. Author (ESRO)

N75-24588 Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
RECENT RADIO OBSERVATIONS OF THE GALACTIC CENTRE **c89**
D. Downes *In* ESRO H2 Regions and the Galactic Centre

Nov. 1974 p 237-256 refs (For availability see N75-24555 15-88)

Recent radio continuum observations of the galactic center region made at Cambridge, Westerbork, and Bonn are reviewed. The maps show considerable fine structure in the sources G1.1-0.1, G0.9+0.1, G0.7-0.0 (Sgr B2), G0.5-0.0, G0.2-0.1, and G359.4-0.1. The observations of Sgr A confirm the general division into two sources: (1) a thermal component of diameter 45 in. which surrounds the galactic nucleus, as defined by the maximum surface brightness at 2.2 microns, and (2) a nonthermal component of diameter 150 in. which may be a supernova remnant. Five sources smaller than 10 in. are found within a5 ft x 5 ft field centered on Sgr A. A radio source of angular diameter <0.1 in. may be the actual nucleus of the galaxy.
Author (ESRO)

N75-24589 Nuffield Radio Astronomy Labs., Jodrell Bank (England).
OBSERVATIONS OF NEUTRAL HYDROGEN IN THE REGION 355 DEG GREATER THAN l SUP II GREATER THAN 10 DEG AND -5 DEG GREATER THAN b SUP II GREATER THAN 5 DEG **c89**
R. J. Cohen and A. Pedlar *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 257-260 refs (For availability see N75-24555 15-88)

Studies of the 21 cm hydrogen line from the central regions of the galaxy are reported. The instruments are the Mark 2(31 ft x 35 ft HPBW) and Mark 1A(13 ft HPBW) radio telescopes.
Author (ESRO)

N75-24590 California Univ., Santa Cruz. Lick Observatory Board of Studies in Astronomy and Astrophysics.
INTENSE SUB-ARCSECOND STRUCTURE IN THE GALACTIC CENTER **c89**
Bruce Balick and Robert L. Brown (Natl. Radio Astronomy Obs., Charlottesville, Va.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 261-265 refs Sponsored in part by NSF (For availability see N75-24555 15-88)

The detection of strong radio emission from bright (brightness > or equal to 10 to the 7th power K), unresolved (theta < or equal to 0.1 in.) structure in the inner 1 pc core of the galactic nucleus is reported.
Author (ESRO)

N75-24591 Lecce Univ. (Italy). Inst. of Physics.
EXPECTED INFRARED MOLECULAR LINES FROM THE GALACTIC CENTRE **c89**
E. Bussoletti *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 267-272 refs (For availability see N75-24555 15-88)

Expected intensities (at earth) of rotational H2 and HD lines are computed for Sgr A and Sgr B2 clouds. Radio molecular data are used to compute the half-widths of these lines. It is shown that some lines are detectable with present infrared techniques. Their observation will provide the first direct estimate of masses and of the D/H ratio in very dense clouds.
Author (ESRO)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-24592 Illinois Univ., Urbana.
THE USE OF SUPERNOVAE LIGHT CURVES FOR TESTING THE EXPANSION HYPOTHESIS AND OTHER COSMOLOGICAL RELATIONS Ph.D. Thesis
Bert Woodard Rust 1974 382 p
Avail: Univ. Microfilms Order No. 75-11539

The expansion hypothesis was tested, based on the relation between the time lapse characterizing some phenomenon in a distant galaxy, the observed time lapse, and the velocity of recession. If the red shift is a Doppler effect, the observed time lapse should be lengthened by the same factor as the wave length of the light Type 1 supernovae were used for great luminosity and the uniformity of their light curves. There were thirty-six light curves gathered from literature, one measured, and all reduced to a common photometric system. It is shown that at the present rate of supernova discoveries, only a few more years would be required to obtain the necessary data for definite tests if light curves are systematically measured for the more distant supernovae.
Dissert. Abstr.

N75-24593*# Michigan Univ., Ann Arbor.
DATA USER'S NOTES OF THE RADIO ASTRONOMY EXPERIMENT ABOARD THE OGO-V SPACECRAFT
Fred T. Haddock and S. L. Breckenridge 20 Apr. 1970 46 p (Contract NAS5-9099)
(NASA-CR-143696; UM/RAO-70-3) Avail: NTIS HC $3.75 CSCL 03A

General information concerning the low-frequency radiometer, instrument package launching and operation, and scientific objectives of the flight are provided. Calibration curves and correction factors, with general and detailed information on the preflight calibration procedure are included. The data acquisition methods and the format of the data reduction, both on 35 mm film and on incremental computer plots, are described.
L.B.

N75-24594*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ROCKET ULTRAVIOLET SPECTRUM OF THE PLANETARY NEBULA NGC 7027
Ralph C. Bohlin, Paul A. Marionni, and Theodore P. Stecher May 1975 22 p refs Submitted for publication
(NASA-TM-X-70892; X-672-75-113) Avail: NTIS HC $3.25 CSCL 03B

An ultraviolet spectrum of NGC 7027 was obtained with a rocket-borne telescope. The observed fluxes are given on an absolute basis and upper limits are given for the strongest predicted lines which were not observed. The extinction correction was made on the basis of the observed and calculated line ratios for the hydrogenic recombination line of He 2 at 1640A to H beta. The extinction is in agreement with ground based determinations. When corrected for extinction the C 4 resonance line at 1549A is in good agreement with the intensity calculated from models, but the C 3 intercombination line at 1909A is a factor of ten too bright. The addition of dielectronic recombination to the models sufficiently changes the C 3 concentration to reduce the discrepancy to a factor of four. The abundance of carbon is assumed to be 2 x 0.0001 that of hydrogen. Using carbon abundances for the sun, this discrepancy disappears and there must be attenuation in the C 4 line. Since the optical depth is approximately 10,000 at the line center, no appreciable number of absorbing grains can exist in the C 4 producing region of the nebula.
Author

N75-24595*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL VARIABILITY OF Cyg X-3
P. J. Serlemitsos, E. A. Boldt, S. S. Holt, Richard E. Rothschild, and J. L. R. Saba (Md. Univ., College Park) Apr. 1975 19 p refs
(NASA-TM-X-70891; X-661-75-98) Avail: NTIS HC $3.25 CSCL 03B

The 1.7-40 keV spectra of Cyg X-3 obtained about a year apart, using the same rocket payload, show large spectral differences. The two observations suggest that while the luminosity of this source remains roughly the same, its spectrum can vary from a featureless blackbody distribution to a flat spectrum which includes strong iron line emission at approximately 6.7 keV. The flux in the line corresponds to an equivalent continuum width of 1.2 keV.
Author

N75-24596*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEMPORAL X-RAY ASTRONOMY WITH A PINHOLE CAMERA
Stephen S. Holt May 1975 38 p refs Presented at the COSPAR Symp. on Fast Transients in X- and Gamma-rays; Varna, Bulgaria; May 1975 Submitted for publication
(NASA-TM-X-70893; X-661-75-114) Avail: NTIS HC $3.75 CSCL 03B

Preliminary results from the Ariel-5 all-sky X-ray monitor are presented, along with sufficient experiment details to define the experiment sensitivity. Periodic modulation of the X-ray

emission was investigated from three sources with which specific periods were associated, with the results that the 4.8 hour variation from Cyg X-3 was confirmed, a long-term average 5.6 day variation from Cyg X-1 was discovered, and no detectable 0.787 day modulation of Sco X-1 was observed. Consistency of the long-term Sco X-1 emission with a shot-noise model is discussed, wherein the source behavior is shown to be interpretable as approximately 100 flares per day, each with a duration of several hours. A sudden increase in the Cyg X-1 intensity by almost a factor of three on 22 April 1975 is reported, after 5 months of relative source constancy. The light curve of a bright nova-like transient source in Triangulum is presented, and compared with previously observed transient sources. Preliminary evidence for the existence of X-ray bursts with duration less than 1 hour is offered. Author

N75-24597*# Arizona Univ., Tucson. Lunar and Planetary Lab.
INFRARED SPECTROSCOPY OF COMET KOHOUTEK Final Report
Uwe Fink 15 May 1975 14 p
(Grant NGR-03-002-392)
(NASA-CR-142809) Avail: NTIS HC $3.25 CSCL 03A

Interferometry observations from 90-in. and 61-in. telescopes tracking the Comet Kohoutek are summarized. Laboratory reflection studies of ices potentially useful for future cometary work were conducted. The frosts studied included: H2O, CO2 NH3, H2S, CH4, NH4HS, and ammonia polysulfide. The frost spectra show remarkable changes with the temperatures, particularly in the case of hydrogen sulfide. Additional analysis found the variation in the H2S ice spectrum to be due to a phase change from a low temperature tetragonal unit cube to a higher temperature face-centered cubic structure. The spectra data indicate that if frost spectra are required for comparison with observed cometary or planetary absorption, the temperature of the frost must be matched. L.B.

N75-24598*# Texas Univ., Austin. Dept. of Astronomy.
COPERNICUS OBSERVATIONS OF BETELGEUSE AND ANTARES
A. P. Bernat and D. L. Lambert [1975] 32 p refs
(Grant NsG-5005)
(NASA-CR-142815) Avail: NTIS HC $3.75 CSCL 03A

Copernicus observations of the M-supergiants, alpha Ori and alpha Sco, are presented. The MgII h and k resonance lines are strongly in emission in both stars. The k line is highly asymmetric in both stars but the h line is symmetric. Upper limits for several other resonance lines are given for alpha Ori. The possibility is explored that the k line asymmetry is caused by overlying resonance lines of MnI and FeI formed in the cool circumstellar gas shells around these stars. Observations of the MnI 4030-4033 A lines are used to show that circumstellar shell absorption is too weak to explain the asymmetry. It is suggested that the absorption occurs in a cool turbulent region between the base of the circumstellar shell and the top of the chromosphere. Author

N75-24599*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A TABLE OF SEMIEMPIRICAL gf VALUES. PART 1: WAVELENGTHS: 5.2682 nm TO 272.3380 nm
R. L. Kurucz and E. Peytremann 14 Feb. 1975 415 p refs 3 Vol.
(Grant NsG-7054)
(NASA-CR-142879; SAO-Special-Rept-362-Pt-1) Avail: NTIS HC $10.50 CSCL 03A

The gf values for 265,587 atomic lines selected from the line data used to calculate line-blanketed model atmospheres are tabulated. These data are especially useful for line identification and spectral synthesis in solar and stellar spectra. The gf values are calculated semiempirically by using scaled Thomas-Fermi-Dirac radial wavefunctions and eigenvectors found through least-squares fits to observed energy levels. Included in the calculation are the first five or six stages of ionization for sequences up through nickel. Published gf values are included for elements heavier than nickel. The tabulation is restricted to lines with wavelengths less than 10 micrometers. Author

N75-24600*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A TABLE OF SEMIEMPIRICAL gf VALUES. PART 2: WAVELENGTHS: 272.3395 nm TO 599.3892 nm
R. L. Kurucz and E. Peytremann 14 Feb. 1975 403 p refs 3 Vol.
(Grant NsG-7054)
(NASA-CR-142880; SAO-Special-Rept-362-Pt-2) Avail: NTIS HC $10.50 CSCL 03A
For abstract, see N75-24599.

N75-24601*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A TABLE OF SEMIEMPIRICAL gf VALUES. PART 3: WAVELENGTHS: 599.4004 nm TO 9997.2746 nm
R. L. Kurucz and E. Peytremann 14 Feb. 1975 422 p 3 Vol.
(Grant NsG-7054)
(NASA-CR-142881; SAO-Special-Rept-362-Pt-3) Avail: NTIS HC $10.50 CSCL 03A
For abstract, see N75-24599.

N75-24556 Kitt Peak National Observatory, Tucson, Ariz.
THE ORION NEBULA: A PHOTOGRAPHIC STUDY OF SPATIAL STRUCTURE
T. R. Gull *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 1-11 refs Sponsored by NSF (For availability see N75-24555 15-88)

N75-24557 Centre National de la Recherche Scientifique, Meudon (France). Dept. of Fundamental Astrophysics.
OPTICAL OBSERVATIONS OF A FEW SMALL H2 REGIONS DETECTED AT INFRARED WAVELENGTHS
Marie-Claire Lortet-Zuckermann *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 13-17 refs (For availability see N75-24555 15-88)

N75-24558 Consiglio Nazionale delle Ricerche, Frascati (Italy). Lab. di Astrofisica Spaziale.
NGC 7635 AND ITS STELLAR NUCLEUS
Roberto Viotti and Roberto Nesci *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 19-22 refs (For availability see N75-24555 15-88)

N75-24559 Sussex Univ., Brighton (England). Astronomy Centre.
OPTICAL, INFRARED AND RADIO OBSERVATIONS OF TWO H2 REGIONS
M. J. Barlow, M. Cohen (Calif. Univ., Berkeley), and T. R. Gull (Kitt Peak Natl. Obs.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 23-33 refs (For availability see N75-24555 15-88)

N75-24560 Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
COMPACT INFRARED SOURCES ASSOCIATED WITH SOUTHERN H2 REGIONS
Jay A. Frogel and S. Eric Persson *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 35-37 Submitted for publication Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-24555 15-88)

N75-24561 Hale Observatories, Pasadena, Calif.
INFRARED OBSERVATION OF NGC 6334
E. E. Becklin and G. Neugebauer *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 39-42 refs (For availability see N75-24555 15-88)

N75-24562 University Coll., London (England). Dept. of Physics and Astronomy.
RECENT OBSERVATIONS OF THE 8-13 MICRON SPECTRA OF H2 REGIONS
D. K. Aitken, B. Jones, and J. Penman *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 43-48 refs (For availability see N75-24555 15-88)

N75-24563 Kapteyn Astronomical Lab., Groningen (Netherlands).
ON THE STRUCTURE OF M17S

C. D. Andriesse and J. Koornneef *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 49-51 refs Prepared jointly with European Southern Obs. (For availability see N75-24555 15-88)

N75-24564 Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
WIDE BEAM MEASUREMENTS OF H2 REGIONS IN THE INFRARED
D. Lemke *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 53-59 refs (For availability see N75-24555 15-88)

N75-24565 University Coll., London (England). Dept. of Physics and Astronomy.
FAR INFRARED PHOTOMETRY OF H2 REGIONS
I. Furniss, R. E. Jennings, and A. F. M. Moorwood *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 61-68 refs Sponsored in part by Sci. Res. Council (For availability see N75-24555 15-88)

N75-24566 University Coll., London (England). Dept. of Physics and Astronomy.
FAR INFRARED OBSERVATIONS OF W51 AND THE GALACTIC CENTRE
J. A. Alvarez, I. Furniss, R. E. Jennings, K. J. King, and A. F. M. Moorwood *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 69-78 refs Sponsored in part by Sci. Res. Council (For availability see N75-24555 15-88)

N75-24567* Harvard Coll. Observatory, Cambridge, Mass. Center for Astrophysics.
HIGH-RESOLUTION MAPS OF H2 REGIONS AT FAR-INFRARED WAVELENGTHS
G. G. Fazio, D. E. Kleinmann, R. W. Noyes, E. L. Wright, M. Zeilik, II, and F. J. Low (Arizona Univ., Tucson) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 79-85 refs Prepared jointly with Smithsonian Astrophys. Obs. (For availability see N75-24555 15-88)
(Grant NGR-22-007-270)
CSCL 03A

N75-24568 Queen Mary Coll., London (England).
ONE MILLIMETER OBSERVATIONS OF H2 REGIONS
P. E. Clegg and P. A. R. Ade *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 93-99 refs (For availability see N75-24555 15-88)

N75-24569* Lockheed Missiles and Space Co., Palo Alto, Calif.
NEW OBSERVATIONS OF H2 REGIONS AT 7.875, 15.5, 31.4, OR 85 GHz
Hugh M. Johnson *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 103-110 refs (For availability see N75-24555 15-88)
(Contracts NAS2-7842; NAS5-23340)
CSCL 03A

N75-24570 Mullard Radio Astronomy Observatory, Cambridge (England). Cavendish Lab.
HIGH-RESOLUTION RADIO OBSERVATIONS OF THE SOURCES NEAR K3-50
Stella Harris *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 111-115 refs Sponsored by Sci. Res. Council (For availability see N75-24555 15-88)

N75-24571 Leiden Univ. Observatory (Netherlands). Huygens Lab.
A HIGH-RESOLUTION STUDY OF THE H2 REGION W 3(OH)
R. H. Harten *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 117-120 refs (For availability see N75-24555 15-88)

N75-24572 Nuffield Radio Astronomy Labs., Jodrell Bank (England).
RADIO RECOMBINATION LINES FROM CARBON AND HEAVIER ELEMENTS FROM THE DIRECTION OF NGC 2024
L. Hart and A. Pedlar *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 121-123 refs (For availability see N75-24555 15-88)

N75-24573 Leiden Univ. Observatory (Netherlands).
OH AND THE EARLIEST EVOLUTION OF H2 REGIONS
H. J. Habing *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 127-134 refs (For availability see N75-24555 15-88)

N75-24575 Padua Univ. (Italy). Asiago Astrophysical Observatory.
NUCLEI AND H2 REGIONS IN SPIRAL GALAXIES: PRELIMINARY RESULTS FOR M 101
P. Benvenuti and S. DOdorico *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 145-150 refs (For availability see N75-24555 15-88)

N75-24581 Osservatorio Astrofisico di Arcetri, Florence (Italy).
THE GAS-TO-DUST RATIO IN THE ORION NEBULA
M. Perinotto and P. Patriarchi *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 191-194 refs (For availability see N75-24555 15-88)

N75-24582 State Univ. of New York, Stony Brook. Dept. of Earth and Space Sciences.
CARBON MONOXIDE MAPPING OF 100 MICROMETER SOURCES ASSOCIATED WITH DARK CLOUDS: PRELIMINARY RESULTS
M. Simon and M. N. Simon (Brookhaven Natl. Lab.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 203-207 refs (For availability see N75-24555 15-88)

N75-24584* State Univ. of New York, Albany.
DUST IN THE GALACTIC CENTER
J. Mayo Greenberg and Soo Hong Seung *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 221-225 refs Prepared jointly with Dudley Obs. (For availability see N75-24555 15-88)
(Grant NGR-33-011-043)
CSCL 03B

N75-24585 Kapteyn Astronomical Lab., Roden (Netherlands).
THE DOMINANT 10 TO 20 MICROMETER SOURCE IN THE GALACTIC CENTRE
J. Borgman, J. Koornneef, and M. deVries *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 229-233 refs Prepared jointly with European Southern Obs. (For availability see N75-24555 15-88)

N75-24586 Kapteyn Astronomical Lab., Groningen (Netherlands).
MULTICOLOUR FAR-INFRARED PHOTOMETRY OF THE GALACTIC CENTRE REGION
H. Olthof *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 235-238 refs Sponsored by Dutch Roy. Acad. of Sci. (For availability see N75-24555 15-88)

N75-24588 Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
RECENT RADIO OBSERVATIONS OF THE GALACTIC CENTRE
D. Downes *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 237-256 refs (For availability see N75-24555 15-88)

N75-24589 Nuffield Radio Astronomy Labs., Jodrell Bank (England).
OBSERVATIONS OF NEUTRAL HYDROGEN IN THE REGION 355 DEG GREATER THAN l SUP II GREATER THAN 10 DEG AND -5 DEG GREATER THAN b SUP II GREATER THAN 5 DEG
R. J. Cohen and A. Pedlar *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 257-260 refs (For availability see N75-24555 15-88)

N75-24590 California Univ., Santa Cruz. Lick Observatory Board of Studies in Astronomy and Astrophysics.
INTENSE SUB-ARCSECOND STRUCTURE IN THE GALACTIC CENTER
Bruce Balick and Robert L. Brown (Natl. Radio Astronomy obs.,

Charlottesville, Va.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 261-265 refs Sponsored in part by NSF (For availability see N75-24555 15-88)

N75-24591 Lecce Univ. (Italy). Inst. of Physics.
EXPECTED INFRARED MOLECULAR LINES FROM THE GALACTIC CENTRE
E. Bussoletti *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 267-272 refs (For availability see N75-24555 15-88)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-24602 Michigan Univ., Ann Arbor.
THEORETICAL EMISSION LINE PROFILES FOR NOVAE Ph.D. Thesis
Donald Richard Bochonko 1974 139 p
Avail: Univ. Microfilms Order No. 75-10135

Theoretical emission line profiles were computed for spherically symmetric, nonrotating, radially expanding models of shells ejected by novae. The theory of the formation of the emission line profile is developed using Gaussian wavelength distributions for the volume absorption and emission coefficients. The expression for the energy emission from the shell is evaluated in detail. The behavior of the theoretical profiles is examined for changes in the following parameters: distribution through the shell of the speed of expansion; thermal broadening; and excitation conditions, specified by the distributions of the densities of absorbing and emitting atoms. An analysis is made of the regions of the shell that contribute to different parts of the profiles.
Dissert. Abstr.

N75-24603 Wisconsin Univ., Madison.
RADIATIVE TRANSFER IN SPHERICAL CIRCUMSTELLAR DUST ENVELOPES Ph.D. Thesis
John Patrick Apruzese 1974 117 p
Avail: Univ. Microfilms Order No. 75-28790

Observational evidence for the existence of circumstellar dust envelopes is summarized. A generalization of the mathematical techniques of Huang is developed. The full spectral distribution of the radiation throughout the envelope is calculated. Several well-observed infrared objects are modelled. It is found that virtually any size dust envelope will allow the spectral distribution of an object to be fitted as long as there is no initial constraint on the infrared dust opacities. It also is found that infrared opacities tend to be significantly larger than those where calculations of nonsalicate grains yield are required to fit the spectral distributions of the objects. The micron bump in the infrared spectrum of two supergiants was theoretically investigated and compared.
Dissert. Abstr.

N75-24604 California Inst. of Tech., Pasadena.
TIME DEPENDENT ACCRETION DISKS AROUND COMPACT OBJECTS, PART 1. THEORETICAL FRAMEWORKS FOR ANALYZING AND TESTING GRAVITATION THEORIES, PART 2 Ph.D. Thesis
Alan Paige Lightman 1974 280 p
Avail: Univ. Microfilms Order No. 74-24448

The theory of time-independent accretion disks around compact objects is developed, generalizing the stationary models of various authors to allow time dependence on the radial-flow time scale. Equations are derived for the time evolution of matter surface density Sigma and for implicit expressions of relevant disk variables in terms of Sigma. Analytic and numerical studies of these equations yield numerical models of mass accretion from a disk onto a compact object and a discovery of the unstable nature of the inner region of the disk, causing a breakdown of current accretion disk models. Theoretical frameworks for analyzing and testing gravitation theories are developed for both nonmetric and metric theories. Highly precise experimental confirmation of the weak equivalence principle is shown to be deadly if not fatal evidence for ruling out all nonmetric theories of gravity. Conservation laws and some common properties of Lagrangian-based metric theories of gravity were also investigated.
Dissert. Abstr.

N75-24605*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
PLASMA IN THE JOVIAN MAGNETOSPHERE
C. K. Goertz Apr. 1975 48 p refs
(Contracts NAS5-5603; NAS2-6563)
(NASA-CR-142761; U-of-Iowa-75-16) Avail: NTIS HC $3.75 CSCL 03B

It is shown that the plasma in Jupiter's ionosphere is collisionless above a certain level. In the outer magnetosphere, where the rotational force dominates the gravitational force, the collisionless plasma has a beam-like distribution and gives rise to a two-stream instability. This leads to trapping of plasma in the centrifugally dominated region of the magnetosphere. Plasma is lost by recombination. Equilibrium-trapped particle densities are calculated by requiring a balance between trapping by wave-particle interaction and loss by recombination. The results are compared with recent observations from Pioneer 10. It is suggested that the observations require an unexplained ion-heating mechanism. Some consequences of the model are discussed.
Author

N75-24606*# Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENTS OF ION FLUXES USING RIEP-2801 M INSTRUMENT ON BOARD MARS-4 AND MARS-5 AUTOMATIC INTERPLANETARY STATIONS
O. L. Vaysberg, A. V. Bogdanov, V. N. Smirnov, and S. A. Romanov Washington NASA May 1975 4 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 129-130
(Contract NASw-2481)
(NASA-TT-F-16352) Avail: NTIS HC $3.25 CSCL 03B

The research initiated by the Mars-2 and Mars-3 planetary probe with the RIEO-2801 M electrostatic charged-particle analyzer was continued aboard Mars-4 and Mars-5. Data obtained in the immediate Mars vicinity by Mars-5 confirmed the conclusion concerning the existence of a boundary shock wave. Data of 20 February 1974 were used to calculate the distance from the center of Mars to the bow point of the shock wave and the altitude of the obstacle in the direction of the Sun, which agree well with the earlier results. Orbital sections where ion spectra typical of the boundary layer were observed are shown graphically.
Author

N75-24607*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY CHARGED PARTICLE MODELS (1974) NASA Space Vehicle Design Criteria (Environment)
Neil Divine Mar. 1975 47 p refs
(NASA-SP-8118) Avail: NTIS HC $3.75 CSCL 03B

The design of space vehicles for operation in interplanetary space is given, based on descriptions of solar wind, solar particle events, and galactic cosmic rays. A state-of-the-art review is presented and design criteria are developed from experiment findings aboard interplanetary and high-altitude earth-orbiting spacecraft. Solar cells were found to be particularly sensitive. Solar protons may also impact the reliability of electric propulsion systems and spacecraft surfaces, as well as causing interference, detector saturation, and spurious signals. Galactic cosmic-ray impact can lead to similar electronic failure and interference and may register in photographic films and other emulsions. It was concluded that solar wind electron measurements might result from differential charging when shadowed portions of the spacecraft acquired a negative charge from electron impact.
Author

N75-24608*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAVITY FIELDS OF THE SOLAR SYSTEM NASA Space Vehicle Design Criteria (Environment)
Alan Zendell, Richard D. Brown, and Samir Vincent Apr. 1975 79 p refs
(NASA-SP-8117) Avail: NTIS HC $4.75 CSCL 03B

The most frequently used formulations of the gravitational field are discussed and a standard set of models for the gravity fields of the earth, moon, sun, and other massive bodies in the

solar system are defined. The formulas are presented in standard forms, some with instructions for conversion. A point-source or inverse-square model, which represents the external potential of a spherically symmetrical mass distribution by a mathematical point mass without physical dimensions, is considered. An oblate spheroid model is presented, accompanied by an introduction to zonal harmonics. This spheroid model is generalized and forms the basis for a number of the spherical harmonic models which were developed for the earth and moon. The triaxial ellipsoid model is also presented. These models and their application to space missions are discussed. Author

N75-24609# Royal Observatory, Edinburgh (Scotland).
GALACTIC STRUCTURE AT I 2 EQUALS 40 DEG
W. A. Sherwood (Ruhr Univ.) 1974 37 p refs Sponosred in part by Sci. Res. Council and Deut. Forschungsges.
(SBN-902553-11-9) Avail: NTIS HC$3.75; Roy. Obs., Edinburgh £ 2.50

Photoelectric photometry of more than 400 stars in the galactic plane 30 deg <1 in. < 50 deg photographic photometry of more than 3000 stars, and objective prism spectral classification of a few hundred stars, in a field in the galactic plane near 1 in. = 40 deg were used to study the distribution of OB stars and dust. Heavy obscuration was found to be the cause of a minimum in young spiral tracers at 1 in. = 40 deg. The obscuration was studied by means of star counts, absorption, reddening with distance, and dispersion in the latter relation. Concentrations of gas, stars, and dust appear to occur at 300 pc, near 1 kpc and beyond 2 kpc at 1 in. = 40 deg. Observations are made on temperatures and composition, together with a value of total to selective absorption. ESRO

N75-24574 California Univ., Santa Cruz. Lick Observatory Board of Studies in Astronomy and Astrophysics.
AN EMPIRICAL MODEL FOR THE STRUCTURE OF THE ORION NEBULA
Bruce Balick, R. H. Gammon (Natl. Radio Astronomy Obs., Charlottesville, Va.), and R. M. Hjellming (Natl. Radio Astronomy Obs., Charlottesville, Va.) *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 135-143 refs (For availability see N75-24555 15-88)

N75-24576* State Univ. of New York, Albany.
EVOLUTIONARY CHARACTERISTICS OF A BIMODAL GRAIN MODEL
J. Mayo Greenberg and Soo Hong Seung *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 153-162 refs Prepared jointly with Dudley Obs. (For availability see N75-24555 15-88)
(Grant NGR-33-011-043)
CSCL 03B

N75-24577* Consiglio Nazionale delle Ricerche, Frascati (Italy). Lab. di Astrofisica Spaziale.
DUST IN H2 REGIONS
Nino Panagia *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 163-171 refs Sponsored in part by NASA and ESRO (For availability see N75-24555 15-88)
(Grant NSF GP-36426X)
CSCL 03B

N75-24578* Stanford Univ., Calif. Inst. for Plasma Research.
IONISATION STRUCTURE AND TRANSFER OF RADIATION IN DUSTY NEBULAE
Vahe Petrosian *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 173-178 refs Sponsored in part by Alfred P. Sloan Found. (For availability see N75-24555 15-88)
(Grant NGR-05-020-510)
CSCL 03B

N75-24579* Cornell Univ., Ithaca, N.Y. Centre for Radiophysics and Space Research.
EXPECTED FAR INFRARED POLARIZATION OF H2 REGIONS AND THE NUCLEI OF GALAXIES
Martin Harwit *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 179-184 refs (For availability see N75-24555 15-88)
(Grant NGR-33-010-172)
CSCL 03B

N75-24580 Observatoire de Paris-Meudon (France).
CALCULATION OF INFRARED SPECTRA FROM DUST IN PLANETARY NEBULAE
N. Epchtein, E. Bussoletti (Lecce Univ., Italy), and J. P. Baluteau *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 185-190 refs (For availability see N75-24555 15-88)

N75-24583 University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
STAR FORMATION AND CONTRACTION/ FRAGMENTATION PROBLEMS
A. P. Whitworth *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 209-220 refs Sponsored in part by Sci. Res. Council and North Atlantic Treaty Organ. (For availability see N75-24555 15-88)

N75-24587 Kapteyn Astronomical Lab., Groningen (Netherlands).
INFRARED RADIATION MODEL FOR THE GALACTIC CENTRE
C. D. Andriesse *In* ESRO H2 Regions and the Galactic Centre Nov. 1974 p 239-245 refs (For availability see N75-24555 15-88)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-24610 Brown Univ., Providence, R.I.
MARTIAN OBLITERATIONAL HISTORY Ph.D. Thesis
Kenneth Lawrence Jones 1974 125 p
Avail: Univ. Microfilms Order No. 75-9183

It is shown that Mars experienced a brief episode of an increased obliteration rate contemporaneous with the formation of the cratered plains (pc) units. The obliteration rate during this episode was at least an order of magnitude greater than the pre-existing rate. The obliteration rates prior to and after the event were identical within a factor of 3. Regional variations in the observed densities of degraded craters on the cratered terrain are shown to result from differences in the intensity of the obliteration rate during the event. The identification and characterization of the event was accomplished using crater diameter-frequency distributions, not only for the total crater population, but also for four morphological classes. Distributions were selected from 38 regions within the Martian equatorial latitudes. Many of the water-formed features on the planet, such as the channels and polar laminated deposits, may have formed during the obliteration event. Dissert. Abstr.

N75-24611*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF SOLAR PLASMA NEAR MARS AND ON EARTH-MARS PATH BY MEANS OF A CHARGED-PARTICLE TRAP ABOARD SOVIET SPACECRAFT, 1971 - 1973. PART 3: CHARACTERISTICS OF PLASMA ION AND ELECTRON COMPONENTS IN THE ANTISOLAR PART OF NEAR-MARTIAN SPACE MEASURED BY MARS-5
K. I. Gringauz, V. V. Berzrukikh, M. I. Verigin, and A. P. Remizov Washington NASA May 1975 10 p refs Transl. into ENGLISH from Kosmich. Issled. Akad. Nauk SSSR (Moscow), v. 13, no. 1, Jan.-Feb. 1975 p 123-128
(Contract NASw-2481)
(NASA-TT-F-16351) Avail: NTIS HC $3.25 CSCL 03B

Preliminary data is expanded, analyzed, and confirmed on boundary locations and characteristics of the transition layer behind the front of the detached near-Martian shock wave and measurement data on the formation characteristics of plasma located behind the inner boundary of the transition layer in the antisolar part of the near-Martian space. Orbit segments of the Mars orbiting probes are shown at spots where they cross the front of the shock wave, which subdivided the space near the planet into three plasma zones. Plasma characteristics of the

first and second zones correspond, respectively, to the unperturbed solar wind and to the transition layer behind the front of the shock wave. It is concluded that the entire combination of plasma and magnetic measurement data in the third zone indicates the magnetic nature of the obstacle which forms the detached near-Martian shock wave. Author

N75-24612*# Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF INTENSITY AND SPECTRAL CHARACTERISTICS OF RADIATION IN THE LYMAN-ALPHA LINE IN THE UPPER MARTIAN ATMOSPHERE
Zh.-L. Berto, Zh. Blamon, C. I. Babichenko, N. N. Dementyeva, A. V. Dyachkov, V. G. Kurt, V. A. Sklyankin, A. S. Smirnov, and S. P. Chuvakhin Washington NASA May 1975 11 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 42-47
(Contract NASw-2481)
(NASA-TT-F-16339) Avail: NTIS HC $3.25 CSCL 03B

A photometer for recording solar radiation in the Lyman-alpha line (wavelength 1216 A) scattered in the Martian atmosphere was installed on board the Mars-5 station, launched toward Mars in August 1973. Narrow-band filters permitted estimating the width of the line L sub alpha scattered in the upper Martian atmosphere. The temperature of the planetary exosphere was determined from the width of the emission line in the atmosphere of Mars. The temperature of the exosphere was found to be 325 + or - 30 K, while the temperature in the altitude range 200-87 km was found to be T sub c = 315 + or - 30 K (c = critical level). Author

N75-24613*# Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY RESULTS OF MEASURING WATER VAPOR CONTENT IN PLANETARY ATMOSPHERE FROM MEASUREMENTS ON BOARD THE MARS-5 AUTOMATIC INTERPLANETARY STATION
V. I. Moroz and A. E. Nadzhip Washington NASA May 1975 5 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 33-36
(Contract NASw-2481)
(NASA-TT-F-16337) Avail: NTIS HC $3.25 CSCL 03B

A special interference-polarization photometer, model IV-3, on board Mars-3, was used to measure the water vapor content in the Martian atmosphere in the period 21 February to 1 March 1974. The data showed that the H2O content in some regions of Mars reaches 100 microns of precipitable water. In regions only several hundreds of kilometers apart, the H2O content of the atmosphere can differ by two to three times. The highest humidity was observed west of the broken terrain in the Araxes Region. This set of measurements was compared with earlier measurements: 1965-1968 and 1971-1972. Author

N75-24614*# Kanner (Leo) Associates, Redwood City, Calif.
MAGNETIC FIELD OF THE PLANET MARS BASED ON MARS-3 AND MARS-5 SATELLITE DATA
Sh. Sh. Dolginov, Ye. G. Yeroshenko, and L. N. Zhuzgov Washington NASA May 1975 24 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 108-122
(Contract NASw-2481)
(NASA-TT-F-16350) Avail: NTIS HC $3.25 CSCL 03B

Martian magnetic field data from the Mars-2 and Mars-3 are reviewed and the Mars-5 measurements are analyzed. The proper perspective is established by displaying the orbit projections in the solar-ecliptic system of coordinates and by considering the orbit parameters and metrological aspects of the experiment jointly with conditions in interplanetary space. Examination of all available data resulted in the conclusion that Mars possesses its own magnetic field which, under influence of solar wind, assumes the typical shape of a magnetosphere. It is restricted on the dayside to 2200 km and extended into the nightside to 7500 to 9500 km from the plant's surface. The effective magnetic moment of Mars is estimated from the position of the shock front during the measurements of 20 and 22 February 1974 as M = 2.5 x 10 to the 22nd power gauss cu cm. The topology of field lines on the dayside at the 1100 km altitude and on the nightside at 2500 to 9000 km altitude can best be explained by accepting that the axis of the Martian magnetic dipole is inclined 15 to 20 deg to the rotation axis. Author

N75-24615*# Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY RESULTS OF RESEARCH CONDUCTED ABOARD THE SOVIET MARS-4, MARS-5, MARS-6, AND MARS-7 PLANETARY PROBES
V. I. Moroz Washington NASA May 1975 10 p Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 3-8
(Contract NASw-2481)
(NASA-TT-F-16333) Avail: NTIS HC $3.25 CSCL 03B

Studies performed with the planetary probes Mars-4 to Mars-7 are reviewed and summarized. The arrival schedule of the planetary probes and the sequence of actual events is described. The orbital parameters of the orbiting Mars-5 probe are presented, as well as planet surface coordinates of the Mars-6 descent module. Maps indicating the tracks of the probe instrumentation optical axis on the planet's surface are presented. Author

N75-24616*# Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL MEASURING COMPOSITION OF MARTIAN ATMOSPHERE ON BOARD THE DESCENT MODULE OF THE MARS-6 SPACE STATION
V. G. Stomin, K. V. Grechnev, L. N. Ozerov, M. Ye. Slutskiy, V. A. Pavlenko, and V. N. Tsvetkov Washington NASA May 1975 9 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan. - Feb. 1975 p 16-20
(Contract NASw-2481)
(NASA-TT-F-16335) Avail: NTIS HC $3.25 CSCL 03B

Experiments on Martian atmospheric parameters were conducted on board the descent module of the Mars 6 station, using a mass spectrometer with radiofrequency mass analyzer during the trajectory section of entry and parachuting. The mass spectrometer was equipped with a radiofrequency mass analyzer, a gas admission system, and an evacuation system for operating at ambient pressure 0.5 to 6.0 torr. It was found that an inert gas, argon, is a substantial constituent of the Martian atmosphere. Author

N75-24617*# Kanner (Leo) Associates, Redwood City, Calif.
MARTIAN ATMOSPHERE IN THE LANDING SITE OF THE DESCENT MODULE OF MARS-6 (PRELIMINARY RESULTS)
V. S. Avduyevskiy, E. L. Akim, V. I. Aleshin, N. F. Borodin, V. V. Kerzhanovich, Ya. V. Malkov, M. Ya. Marov, S. F. Morozov, M. K. Rozhdestvenskiy, O. L. Ryabov et al Washington NASA May 1975 20 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 21-32
(Contract NASW-2481)
(NASA-TT-F-16336) Avail: NTIS HC $3.25 CSCL 22B

On 12 March 1974 the Mars-6 station reached the vicinity of Mars and after terminal correction, its descent module was separated from it. Preliminary analysis of all measurements shows that an atmosphere with the following parameters fits the proposed model most satisfactorily: T0 = 230 K; Ti (temperature of isothermal region) = 155 K; gamma (temperature gradient) = 2.5 deg/km; and hT (altitude of troposphere) < or equal to 30 km. The landing site was found to be 400 m above the level P = 6.1 mbar. It was held improbable that the constant wind velocity component was more than approximately 10 m/sec. Author

N75-24618*# Kanner (Leo) Associates, Redwood City, Calif.
OZONE IN THE PLANETARY ATMOSPHERE FROM MEASUREMENTS ON BOARD THE MARS-7 AUTOMATIC INTERPLANETARY STATION
V. A. Krasnopolskiy, A. A. Krysko, and V. N. Rogachev Washington NASA May 1975 9 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), V. 13, no. 1, Jan.-Feb. 1975 p 37-41
(Contract NASw-2481)
(NASA-TT-F-16338) Avail: NTIS HC $3.25 CSCL 03B

A two-channel filter photometer with high spatial resolution (6') was installed on board the Mars-7 spacecraft to measure the atmospheric ozone content used in the photometric profile of the planetary limb within and without the ozone absorption band. It was found that in the Martian atmosphere there is an ozone layer at the altitude approximately 40 km, in which ozone is three times less concentrated than on earth. Author

N75-24619*# Kanner (Leo) Associates, Redwood City, Calif.
POLARIMETRIC EXPERIMENT ON BOARD MARS-5
L. V. Ksanfomaliti, V. I. Moroz, and A. Dollfus Washington NASA May 1975 10 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 92-98
(Contract NASw-2481)
(NASA-TT-F-16348) Avail: NTIS HC $3.25 CSCL 03B

The Mars-5 polarimetric experiment measured the degree of light polarization and the brightness of Mars during observations from orbit. The craft was equipped with two identical polarimeters in the 3200-7000 A range with 0.3-24% polarization limits at a brightness of .00003 to .01 W/sq cm x micrometer x sterad. One polarimeter was installed to observe the planet at the phase angle of 60 deg, and the other at the phase angle of 90 deg. Measurements clearly show three portions: the limb transits where the light is strongly polarized by the atmosphere, measurements along the track where the light is polarized by the surface, and the zone of the terminator, where increased polarization is also observed. The polarization values measured are lower than expected. The maximum values at 6000 A barely exceed 9% near the northern tip of the crater in the sea Argyre, and the minimum values are 6%. Author

N75-24620*# Kanner (Leo) Associates, Redwood City, Calif.
SPECTROPHOTOMETRY OF MARS IN THE 2-5 MICROMETER RANGE ON BOARD THE MARS-5 AUTOMATIC INTERPLANETARY STATION
V. I. Moroz and N. A. Parfentyev Washington NASA May 1975 7 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 80-83
(Contract NASW-2481)
(NASA-TT-F-16345) Avail: NTIS HC $3.25 CSCL 03B

More than 500 spectra in the 2 to 5 micrometer range were obtained by the spectrophotometer on board the Mars 5 station. A typical spectrum was obtained on the 25 February 1974 track when the zenith distance of the sun was -45.0 deg and that of the station was -30.1 deg. In this spectrum, the radiation levels measured at the frequencies of the narrow-band filter of the spectrophotometer are compared with the brightness of the reflected solar radiation. The observed distribution coincides well with the first calculated curve, except for two dips which are explained by the adsorption bands of carbon dioxide and crystalline water. Author

N75-24621*# Kanner (Leo) Associates, Redwood City, Calif.
INFRARED RADIOMETRY ON BOARD MARS-5
L. V. Ksanfomaliti and V. I. Moroz Washington NASA May 1975 6 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 77-79
(Contract NASw-2481)
(NASA-TT-F-16344) Avail: NTIS HC $3.25 CSCL 03B

The IRM-73 radiometer aboard the Mars-5 planetary probe was intended to measure the brightness temperature of the planet's surface in the range of 110-300 K. Its optical diagram and description are included. The directivity pattern of the radiometer is about 1 deg, corresponding to the portion of the surface with a 35 km diameter at the pericenter. The spectral range of the radiometer is 8 to 26 micrometer, with the 14-17 micrometer band rejected to avoid errors caused by CO2 in the Martian atmosphere. Measurement results are shown in the form of a curve presenting the variation of brightness temperatures along the track of 23 February 1974. The maximum recorded temperature is 272 K. In the vicinity of the terminator, the temperature drops to 230 deg; and at the end of the track, it drops to 200 K. Author

N75-24622*# Kanner (Leo) Associates, Redwood City, Calif.
RESULTS OF GEOLOGO-MORPHOLOGICAL ANALYSIS OF SOME PHOTOGRAPHS OF THE MARTIAN SURFACE OBTAINED BY THE MARS-4 AND MARS-5 AUTOMATIC STATIONS
K. P. Florenskiy, A. T. Bazilevskiy, R. O. Kuzmin, and I. M. Chernaya Washington NASA May 1975 17 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 67-76
(Contract NASw-2481)
(NASA-TT-F-16343) Avail: NTIS HC $3.25 CSCL 03B

A detailed geological-morphological map is included for the investigated area (about 700 x 900 sq km) between the Holden crater and the northern portion of the Argyre circular structure. The other map is of the dissemination of craters, which are the prevailing relief configuration in the area studied. Four morphological classes of crater are described, and curves are presented which show how the crater distribution density and relative abundance of various classes of craters depend on the crater size. Five different types of valleys are described and observed phenomena on slopes are discussed, as well as eolian and tectonic surface formations. Author

N75-24623*# Kanner (Leo) Associates, Redwood City, Calif.
INSTRUMENTATION AND SOME RESULTS OF PHOTOGRAPHIC STUDY ON BOARD THE MARS-4 AND MARS-5 AUTOMATIC STATIONS
A. S. Selivanov, M. K. Narayeva, B. A. Suvorov, I. F. Sinelnikova, and M. I. Bokhonov Washington NASA May 1975 11 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan. - Feb. 1975 p 60-66
(Contract NASw-2481)
(NASA-TT-F-16342) Avail: NTIS HC $3.25 CSCL 03B

The phototelevision system of the Mars-4 and Mars-5 planetary probes and the results obtained are described. The system contains two phototelevision units which differ only by the focal lengths of their camera -- 50 and 350 mm -- to operate with resolutions of 700 and 100 m, respectively. The short-focal-length camera was equipped with four interchangeable filters: red, green, blue, and orange; while the long focal length camera had an orange filter only. Functionally, each unit contains operational programs with commands from the earth. Composition of the phototelevision unit is shown schematically, and its operation is explained. All technical parameters are tabulated. The photographs obtained (frame size: 23 x 22.5 sq mm) were transmitted for preliminary viewing with a scanning resolution of 250 x 250, and some had a nominal scanning resolution of 1000 x 1000. A table is included for all photographs made by the various units and resolutions transmitted, as well as two sample photographs. Author

N75-24624*# Kanner (Leo) Associates, Redwood City, Calif.
RESULTS OF INVESTIGATING THE MARTIAN ATMOSPHERE BY RADIO-OCCULTATION USING THE MARS-2, MARS-4, AND MARS-6 CRAFT
M. A. Kolosov, O. I. Yakovlev, G. D. Yakovleva, A. I. Yefimov, B. P. Trusov, T. S. Timofeyeva, V. A. Vingradov, V. P. Oreshkin, and Yu. M. Kruglov Washington NASA May 1975 10 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 54-59
(Contract NASw-2481)
(NASA-TT-F-16341) Avail: NTIS HC $3.25 CSCL 03B

For the region with latitude -52 deg, longitude 70 deg, near-surface pressure was found to be 6.7 mbar. For solar zenith angles 82-72 deg, the principal ionospheric maximum with electron concentration (7.1-9.3 times 10,000/cm) begins to appear at the altitudes 135-145 km, while at a solar zenith angle of 50 deg, the maximum electron concentration is 1.7 (10,000/cu cm). The scale of altitudes in the upper part of the daytime ionosphere has the value 32-38 km. The daytime Martian ionosphere has a second ionospheric maximum at the altitude 110-115 km. Author

N75-24625*# Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY RESULTS OF TWO-FREQUENCY RADIO-OCCULTATION OF THE MARS IONOSPHERE BY MEANS OF MARS PLANETARY PROBES IN 1974
M. B. Vasilyev, A. S. Vyshlov, M. A. Kolosov, N. A. Savich, V. A. Samovol, L. N. Samoznayev, A. I. Sidorenko, Yu. N. Aleksandrov, A. I. Danilenko, V. M. Dubrovin et al Washington NASA May 1975 10 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 48-53
(Contract NASw-2481)
(NASA-TT-F-16340) Avail: NTIS HC $3.25 CSCL 03B

The two-frequency radio-occultation of the Mars ionosphere by Mars-4 on 10 February 1974 and Mars 6 on 12 March 1974 was carried out to determine the altitudinal distribution of electron concentration in the Martian atmosphere above the nighttime and daytime sides of the planet. In the space and ground-based interferometer system, both frequency signals were

received and processed to produce phase differences and frequency differences as a function of time and beam elevation above the Martian surface. Detailed curves representing these Mars-4 data are shown. Author

N75-24626*# Brigham Young Univ., Provo, Utah. Dept. of Physics and Astronomy.
PRELIMINARY MODEL STUDIES OF THE MAGNETOSPHERE OF JUPITER: PIONEER 10
Douglas E. Jones and John G. Melville Mar. 1975 19 p refs (Contract NAS2-7358)
(NASA-CR-142813) Avail: NTIS HC $3.25 CSCL 03B

Observations of the Jovian magnetic field and its interaction with the solar wind plasma were made while the Pioneer 10 spacecraft was within about 100 R sub j of the planet. The magnetosphere was found to be severely stretched due to the presence of an intense current sheet, which was particularly evident during the outbound passage of Pioneer 10 near the dawn terminator. Plots of the angle between the orientation of the outbound field and the radius vector from the planet to the spacecraft showed a strong tendency for the field to become radial at large distances from the planet. A similar trend has also been seen in both the inbound and outbound Pioneer 11 data. Preliminary work on a mathematical model of the magnetosphere of Jupiter is given, based upon the Pioneer 10 outbound data. Some of the implications of the radial field configuration inferred from the Pioneer 10 and 11 data are also discussed. Author

N75-24627*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
INNERMOST PLANETS OF THE SOLAR SYSTEM
1974 4 p refs
(NASA-CR-142827; Issue-1) Avail: NTIS HC $3.25 CSCL 03A

The appearance and characteristics of Mercury and Venus as evening and morning stars are discussed. Inferior and superior conjunction are defined. The motions, phases, and planetary dynamics of the two planets are compared with those of the earth and moon. L.B.

N75-24628*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VENUS AND MERCURY AS PLANETS
1974 4 p
(NASA-CR-142826; Issue-2) Avail: NTIS HC $3.25 CSCL 03B

A general evolutionary history of the solar planetary system is given. The previously observed characteristics of Venus and Mercury (i.e. length of day, solar orbit, temperature) are discussed. The role of the Mariner 10 space probe in gathering scientific information on the two planets is briefly described. L.B.

N75-24629*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MISSION TO THE INNER PLANETS
1974 4 p ref
(NASA-CR-142828; Issue-3) Avail: NTIS Hc $3.25 CSCL 22A

Mariner 10 mission objectives to investigate Mercury and Venus are discussed along with the spacecraft's design and its flight path. Scientific instruments onboard the spacecraft are also discribed. J.M.S.

N75-24630*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VENUS AND MERCURY ENCOUNTERS
1974 4 p refs
(NASA-CR-142829; Issue-4) Avail: NTIS HC $3.25 CSCL 22A

Mariner 10 observations of Venus, Mercury, Comet Kohoutek, and other interplanetary objects are reported. Data cover planetary atmospheres, temperature, and surface detail. E.H.W.

N75-24631*# National Aeronautics and Space Administration, Washington, D.C.
JUPITER: GIANT OF THE SOLAR SYSTEM
[1975] 4 p refs
(NASA-TM-X-66827; Issue-1) Avail: NTIS HC $3.25 CSCL 03B

Jupiter, its relationship to the other planets in the solar system, its twelve natural satellites, solar orbit and the appearance of Jupiter in the sky, and the sightings and motions of Jupiter in 1973 are discussed. Educational study projects for students are also included. M.J.S.

N75-24632*# National Aeronautics and Space Administration, Washington, D.C.
JUPITER: AS A PLANET
[1975] 4 p
(NASA-TM-X-66828; Issue-2) Avail: NTIS HC $3.25 CSCL 03B

The planet Jupiter, its planetary mass and atmosphere, radio waves emitted from Jupiter, thermal radiation, internal structure of Jupiter, and the possibility of life on Jupiter are discussed. Educational study projects are included. M.J.S.

N75-24633*# National Aeronautics and Space Administration, Washington, D.C.
JUPITER AND PLANET EARTH
[1975] 3 p refs
(NASA-TM-X-66829; Issue-3) Avail: NTIS HC $3.25 CSCL 03B

The evolution of Jupiter and Earth are discussed along with their atmospheres, the radiation belts around both planets, natural satellites, the evolution of life, and the Pioneer 10. Educational study projects are also included. M.J.S.

N75-24634*# National Aeronautics and Space Administration, Washington, D.C.
MISSION TO JUPITER
[1975] 4 p refs
(NASA-TM-X-66830; Issue-4) Avail: NTIS HC $3.25 CSCL 03B

The Pioneer 10 and Pioneer 11 space probes and their missions to Jupiter are discussed along with the experiments and investigations which will be conducted onboard. Jupiter's atmosphere, its magnetic fields, radiation belts, the spacecraft instruments, and the Jovian system will be investigated. Educational study projects are also included. M.J.S.

N75-24635*# National Aeronautics and Space Administration, Washington, D.C.
ENCOUNTER WITH JUPITER
[1975] 4 p
(NASA-TM-X-66831; Issue-5) Avail: NTIS HC $3.25 CSCL 03B

Pioneer 10 space probe's encounter with the Jupiter is discussed in detail. Tables are presented which include data on the distances during the encounter, times of crossing satellite orbits, important events in the flight near Jupiter, and time of experiments. Educational study projects are also included. M.J.S.

N75-24636*# National Aeronautics and Space Administration, Washington, D.C.
A NEW LOOK AT JUPITER: RESULTS AT THE NOW FRONTIER
[1975] 7 p refs
(NASA-TM-X-66832; Issue-6) Avail: NTIS HC $3.25 CSCL 03B

Pioneer 10's encounter with Jupiter is discussed along with the interplanetary space beyond the orbit of Mars. Other topics discussed include the size of Jupiter, the Galilean satellites, the magnetic field of Jupiter, radiation belts, Jupiter's weather and interior, and future exploration possibilities. Educational projects are also included. M.J.S.

N75-24637*# National Aeronautics and Space Administration, Washington, D.C.
PIONEER 11 ENCOUNTER
[1975] 7 p
(NASA-TM-X-66833; Issue-7) Avail: NTIS HC $3.25 CSCL 03B

Pioneer 11's encounter with Jupiter is discussed in detail. The scientific experiments carried out on the probe are described along with the instruments used. Tables are included which provide data on the times of experiments, encounters, and the distances from Jupiter. Educational study projects are also given. M.J.S.

N75-24638*# California Inst. of Tech., Pasadena. Seismological Lab.
COMPACTION BY IMPACT OF UNCONSOLIDATED LUNAR FINES
Thomas J. Ahrens [1975] 20 p refs
(Grant NGR-05-002-307)
(NASA-CR-142877; Contrib-2626) Avail: NTIS HC $3.25 CSCL 03B

New Hugoniot and release adiabat data for 1.8 g/cu cm lunar fines in the approximately 2 to 70 kbar range demonstrate that upon shock compression intrinsic crystal density (approximately 3.1 g/cu cm) is achieved under shock stress of 15 to 20 kbar. Release adiabat determinations indicate that measurable irreversible compaction occurs upon achieving shock pressures above approximately 4 kbar. For shocks in the approximately 7 to 15 kbar range, the inferred post-shock specific volumes observed decrease nearly linearly with increasing peak shock pressures. Upon shocking to approximately 15 kbar the post-shock density is approximately that of the intrinsic minerals. If the present data are taken to be representative of the response to impact of unconsolidated regolith material on the moon, it is inferred that the formation of appreciable quantities of soil breccia can be associated with the impact of meteoroids or ejecta at speeds as low as approximately 1 km/sec. Author

N75-24639*# New Mexico State Univ., Las Cruces. Dept. of Astronomy.
VELOCITY VARIATIONS OF AN EQUATORIAL PLUME THROUGHOUT A JOVIAN YEAR
Elmer Reese and Reta Beebe May 1975 14 p refs
(Grant NGL-32-003-001)
(NASA-CR-142894; TN-75-48) Avail: NTIS HC $3.25 CSCL 03B

Features in the equatorial zone of Jupiter show that the equatorial plume reported by Pioneer 10 has existed for an 11-year interval. During this interval the plume has shown an acceleration which can be interpreted as a constant component of 3 x 10 to minus 8th power m/sq cm and a sinusoidal component which anticorrelates with the planetocentric declination of the sun, D sub s, and has an amplitude of -0.96 meters per second per degree change of D sub s. The sinusoidal component has been interpreted in terms of solar heating. Throughout this interval of time the equatorial zone has appeared abnormally dark and has contained many dark projections along the northern edge. When the plume approaches to within 25 to 30 deg of these features they are deflected in the direction of motion of the plume and then dissipate or become obscured as the plume passes. After passage of the plume normal features are again observed. Author

N75-24640*# Joint Publications Research Service, Arlington, Va.
NEW LOOK OF THE OLD MOON
K. A. Kulikov and V. B. Gurevich Washington NASA May 1975 140 p refs Transl. into ENGLISH of the book "Novyy Oblik Staroy Luny" Moscow, Nauka Press, 1974 p 1-152
(NASA Order W-13183)
(NASA-TT-F-16253) Avail: NTIS HC $5.75 CSCL 03B

Important scientific results from fifteen years of lunar exploration are discussed. The moon is examined as a celestial body; its surface characteristics and configurations, age, and gravitational field are described. American and Soviet programs are outlined, from the earliest automatic lunar stations through Apollo 16 and Lunokhod 1. A discussion of some explorations predating 1959 is also included. L.B.

N75-24641*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
HISTORY OF MANNED SPACE FLIGHT
Feb. 1975 15 p
(NASA-TM-X-66817) Avail: NTIS HC $3.25 CSCL 22A

U.S. manned space projects from Mercury Redstone 3 through Skylab 4 are briefly described including dates, flight duration, crew, and number of earth/moon orbits. The flight costs of each project are itemized. Highlights in the history of the manned space program from 1957 to February, 1974 are included. L.B.

N75-24642*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUMMARY OF INITIAL RESULTS FROM THE GSFC FLUXGATE MAGNETOMETER ON PIONEER 11
Mario H. Acuna and Norman F. Ness May 1975 39 p refs Presented at Tucson Jupiter Meeting, 18-23 May 1975 Submitted for publication
(NASA-TM-X-70899; X-690-75-125) Avail: NTIS HC $3.75 CSCL 03B

The main magnetic field of Jupiter was measured and revealed to be considerably more complex than expected. In spherical harmonic representations with maximum order 3 and 4, the dipole term has a magnitude of 4.16 + or - .15 Gauss-R sub j cubed. The quadrupole and octupole moments are proportionately very large, which leads to significant and complex deviation of the planetary magnetic field at distances 4 R sub j from any simple offset tilted dipole. The models show a north polar field strength of 20 to 40 Gauss and a south field strength of 16 to 20 Gauss. Derived L-shell parameters for the radiation belts predict enhanced absorption effects due to the satellite Amalthea and Io. Warping of the charged particle magnetic equator from a plane is also predicted. A similarity in the field origin mechanism for Earth and Jupiter is suggested. Author

N75-24643*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A REVIEW OF THE JOVIAN MAGNETOSPHERE BASED UPON PIONEER 10 AND 11
James H. Trainor May 1975 45 p refs Presented at the Ann. Rev. Session 18th Ann. COSPAR Meeting, Varna, Bulgaria, 3 Jun. 1975
(NASA-TM-X-70900; X-660-75-130) Avail: NTIS HC $3.75 CSCL 03B

Data derived from the plasma, magnetic field, and energetic particle experiments on the December, 1973 and December, 1974 Jupiter encounters are reviewed. A bow shock was discovered on the solar side of the planet, as predicted. However, a smaller magnetic field and larger fluxes of energetic electrons were found than anticipated. A ring current and current sheet in the Jovian plasmasphere are inferred from magnetic field measurements. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-24644*# Wolf Research and Development Corp., Riverdale, Md.
THE INVESTIGATION OF O AND N2 DENSITIES FROM THE OSO-7 EXTREME UV DATA Final Report
3 Feb. 1975 36 p refs
(Contract NASw-2595)
(NASA-CR-142759; WOLF-00079) Avail: NTIS HC $3.75 CSCL 03B

The results of solar radiation observations in the extreme ultra-violet spectrum from 200 A to 600 A made by the OSO-7 Satellite were studied. The results of the influence of attenuation by the atmosphere in the 250 to 500 km altitude range are presented. Using published molecular absorption cross-sections at 304 A and 256 A, the Jaccia atmospheric model is validated, and shows that a mean exospheric of 1050 K is appropriate for the sunset data. Author

N75-24645*# Kanner (Leo) Associates, Redwood City, Calif.
SOME RESULTS OF INVESTIGATION OF SOLAR COSMIC RAYS ON BOARD MARS-7 STATION
S. N. Vernov, N. V. Alekseyev, P. V. Vakulov, N. I. VVologdin, Ye. V. Gorchakov, V. A. Mineyev, N. F. Pisarenko, I. A. Savenko, and B. Ya. Shcherbovskiy Washington NASA May 1975 8 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13,, no. 1, Jan.-Feb. 1975 p 131-135
(Contract NASw-2481)
(NASA-TT-F-16353) Avail: NTIS HC $3.25 CSCL 03B

Data are presented concerning the solar flares of 7 September 1973, recorded in the sun's Southern Hemisphere at

coordinates of 180 deg S 47 deg W. They were obtained by the Mars-7 probe from 6 to 18 September while the earth and the probe were North of the solar equatorial plane at about 70 latitude. The mutual geometry of the sun, earth, probe and Mars is shown graphically, and resulting curves are presented depicting fluxes of 50 to 500 keV electrons, 3 to 35 MeV protons, and 250 to 650 keV protons. Their distinct peculiarity was a prolonged negative anisotropy. Analysis of disposition and particle distribution led to the conclusion that the basic flux of flare particles moved from the sun south of the solar equatorial plane and crossed it in a northern direction near Mars' orbit. The Mars-7 probe detectors (gas-discharge, semiconductor, Cerenkov, their quantities and parameters) are described. Author

N75-24646*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR GAMMA-RAY LINES AS PROBES OF ACCELERATED PARTICLE DIRECTIONALITIES IN FLARES
Reuven Ramaty and Carol Jo Crannell Apr. 1975 13 p refs Submitted for publication
(NASA-TM-X-70890; X-660-75-96) Avail: NTIS HC $3.25 CSCL 03B

Anisotropies of charged particles accelerated in solar flares were studied by observing Doppler shifts of selected gamma-ray lines. The spectral shape was calculated of the 6.1-MeV line of O-16. If the accelerated particles are isotropic, the line remains centered at e sub 0 = 6129.4 keV, and its width (FWHM) is about 100 keV. For particle anisotropies that may be produced in solar flares, the line is shifted to lower energies by about 30 to 40 keV. Author

N75-24647# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR GEOPHYSICAL DATA NUMBER 364, DECEMBER 1974. PART 1 (PROMPT REPORTS), DATA FOR NOVEMBER 1974, OCTOBER 1974
Hope I. Leighton Dec. 1974 123 p
(COM-74-50190/364-1; SGD-364-Pt-1; NOAA-75011501) Avail: NTIS MF $2.25; HC $1.40 Avail: Natl. Climatic Center, Attn: Publications, Federal Bldg., Asheville, N.C. 28801 CSCL 03B

Prompt reports are given on data for November 1974 and October 1974 which deal with alert periods, daily solar indices, solar flares, solar radio waves, spacecraft observations, solar proton monitoring, solar X-ray radiation, inferred IP magnetic field polarities, daily solar activity centers, sudden ionospheric disturbances, cosmic rays, geomagnetic indices, and radio propagation indices. An index for 1973 and 1974 is included. GRA

N75-24648# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR GEOPHYSICAL DATA NUMBER 364, DECEMBER 1974. PART 2 (COMPREHENSIVE REPORTS) DATA FOR JUNE 1974 - MAY 1974 AND MISCELLANEA
Hope I. Leighton Dec. 1974 65 p
(COM-74-50190/364-2; SGD-364-Pt-2; NOAA-75011502) Avail: NTIS MF $2.25; HC $1.40 Avail: Natl. Climatic Center, Attn: Publications, Federal Bldg., Asheville, N.C. 28801 CSCL 03B

Comprehensive data for June 1974 and April 1974 on solar flares, solar radio waves, abbreviated calendar record, and regional flare index are given. Data on cosmic rays and solar X-ray radiation are included. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-24649 Utah Univ., Salt Lake City.
THE CHARGE RATIO OF ULTRA HIGH ENERGY COSMIC RAY MUONS Ph.D. Thesis
Gordon Kearl Ashley, II 1974 55 p
Avail: Univ. Microfilms Order No. 75-10087

Data analysis and results are presented of the final charge-ratio experiment using the Utah cosmic-ray muon detector. Values for the charge ratio were obtained from least-squares fits to the observed bending-angle distributions. The fitting function was the result of folding the noise scattering distribution into the ideal local-spectrum bending distribution, with the charge ratio as the parameter of the fit. This method permitted a greater precision while circumventing the main causes of charge-ratio dilution. With the results of this experiment the charge ratio is precisely known over about three decades of muon energy beginning around 10 GeV. The charge ratio serves as a touchstone in determining the hadronic interaction dynamics and composition of the primary cosmic rays. Dissert. Abstr.

N75-24650 Michigan Univ., Ann Arbor.
A CLOUD-CHAMBER SEARCH FOR MULTIPLE-CORES AND HIGH TRANSVERSE-MOMENTA IN COSMIC RAY AIR SHOWERS Ph.D. Thesis
Otis Aultz Keller 1974 163 p
Avail: Univ. Microfilms Order No. 75-10199

The Leeds 2.87 sq m cloud-chamber is located at the center of a 7.2 m x 7.2 m array of ten scintillators that trigger the chamber on showers of approximately 100,000 particles whose cores fall within approximately 5 m of the center of the array. Model calculations indicate that even if every nuclearactive collision in an air shower creates a product hadron with high transverse momentum - and thus a sub-core, only one such sub-core would be detected per month by the Leeds apparatus. Model calculations show that interactions of shower hadrons in the roof should cause about 0.2 dense regions of the size observed in the cloud-chamber. Further evidence for atmospheric origin of the observed dense region is its lateral structure, which differs from that of dense regions in the chamber that are products of local interactions. Model calculations show that the roofing above Kiel detectors is probably not sufficient to develop all of the dense regions that they observe. Dissert. Abstr.

N75-24651 Michigan Univ., Ann Arbor.
MULTIPARTICLE PRODUCTION IN THE INTERACTIONS OF CHARGED COSMIC RAY HADRONS WITH NUCLEAR TARGETS Ph.D. Thesis
Palahalli Ramaiya Viswanath 1974 136 p
Avail: Univ. Microfilms Order No. 75-10325

An experiment was conducted to study interactions of charged cosmic ray hadrons of energy greater than 100 GeV with nuclear targets. The experiment employed two wide gap spark chambers, an ionization calorimeter and targets of aluminum, iron, tin and lead. Out of more than 400 interactions collected over a period of one and one-half years, about 500 interactions were selected for the final analysis. Monte Carlo models for proton-nucleus interactions were developed to correct for the systematic biasses in the data. The ratio of the average charged multiplicity in a proton-nucleus collision to the average charged multiplicity in a proton-proton collision was observed to vary slowly with the mass number of the nucleus; the dependence of this ratio on the mass number was given by a power law with an exponent of 0.129 + or - 0.004. There was no significant variation of this ratio with the energy of the primary particle. Dissert. Abstr.

N75-24652# Brookhaven National Lab., Upton, N.Y.
REPORT ON THE BROOKHAVEN SOLAR NEUTRINO EXPERIMENT
R. Davis, Jr. and J. C. Evans, Jr. 1974 16 p refs Presented at Conf. on Particle Acceleration and Nucl. Reactions in Space, Leningrad, 19-21 Aug. 1974 Sponsored by ERDA
(BNL-19278; Conf-740851-1) Avail: NTIS HC $3.25

THe results of 10 experiments are given that extend over the period June, 1971, to Jan. 25, 1974. From these results it was concluded that the solar neutrino capture rate in C1-37 is less than 1 SNU. This result can be compared to the rate of 5.6 SNU predicted by standard solar model calculations. One experimental run for the period July 7 to Nov. 5, 1972 gave an apparent rate of 6.2 + or - 2.1 SNU, and is higher than any other single experiment. A search was made for a possible neutrino pulse associated with the Jan. 4, 1974 antineutrino pulse observed

by the Pennsylvania-Texas water Cerenkov detectors. Neutrinos were not observed. A discussion is given of various tests performed to measure the recovery of Ar in the detector system. New experiments to test further the argon recovery, and to measure the neutrino capture cross section in C1-37 are briefly described. Author (NSA)

N75-24653# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INFORMATION DEVICES AND SYSTEMS IN PROSPECTING GEOPHYSICS
N. I. Kalashnikov 22 Jan. 1975 304 p refs Transl. into ENGLISH of the book "Inform. Ustroistva i Sistemy Razvedochndi Geophysics" Kiev, Izd. vo Naukova Dumka, 1973 p 1-201
(AD-A007408; FTD-HC-23-2625-74) Avail: NTIS CSCL 08/9

The introduction and Chapter I of the monograph deals with general characteristics of information devices and systems of prospecting geophysics and principles of design of devices for plane-table surveying with consecutive selection of information. Chapter II contains fundamental data on information devices and systems with simultaneous selection of multichannel information and a presentation of the principles of application of holographic ideas in acoustics and seismic prospecting. Chapter III discusses the problems of application of information radio channels and radio devices in prospecting geophysics. Chapter IV contains brief data on ways of designing the devices and systems of processing of geophysical information. GRA

99 GENERAL

N75-24654*# National Aeronautics and Space Administration, Washington, D.C.
KOROLEV: A CHRONICLE
Yaroslav Golovanov Apr. 1975 231 p refs Transl. into ENGLISH from the book "Korolev: Khronika" Moscow, Molodaya Gvardiya, 1973 p 1-254
(NASA-TT-F-16278) Avail: NTIS HC $7.50 CSCL 05B

A partial biography of Sergey Pavlovich Korolev is presented which covers his life from birth to the age of 28. A history of the development of Soviet space and rocket technology during those 28 years is also included. M.J.S.

N75-24655# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 464
13 May 1975 49 p refs Transl. into ENGLISH from various East European reports
(JPRS-64751) Avail: NTIS HC $3.75

Various articles concerning the development and progress in science and technology in eastern Europe are presented. For individual titles, see N75-24656 through N75-24661.

N75-24656 Joint Publications Research Service, Arlington, Va.
NEW TECHNOLOGIES IN METALLURGY STUDIED BY RESEARCH INSTITUTE **c26**
Nikolay Stanev *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 2-4 Transl. into ENGLISH from Rabotnichesko Delo (Sofia), 15 Apr. 1975 p 4 (For availability see N75-24655 15-99)

A special problem laboratory on metals castings in a gas back pressure organized under Varna VMEI as an integration of capabilities between a BAN institute and a higher technical school is described. It is indicated that the laboratory fulfills the increased requirements of scientific collectives for solving major interdisciplinary problems and their rapid introduction into production as well as linking scientific research and educational work. J.M.S.

N75-24657 Joint Publications Research Service, Arlington, Va.
DIGITAL FILM AND PRECIPITATION METER, AND OIL POLLUTION METERING DEVICE **c35**
In its Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 5-6 Transl. into ENGLISH from Meres Es Automatika (Budapest), no. 2, 1975 p 55 (For availability see N75-24655 15-99)

A digital layer thickness measuring instrument developed to monitor the thickness and growth rate of layers deposited by evaporation under a vacuum is described. The instrument is applicable to the manufacture of integrated circuits, optical coatings, and microelectronic components as well as laboratory uses. An instrument suitable for measuring the oil contamination of surface waters and feedwaters, and for determining the total oil concentration in a continuous manner is also described. Operation of the instruments is discussed. J.M.S.

N75-24658 Joint Publications Research Service, Arlington, Va.
ACHIEVEMENTS AND TASKS OF SOLID-STATE RESEARCH IN HUNGARY **c76**
Gyorgy Pataki *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 9-15 Transl. into ENGLISH from Magyar Tudomany (Budapest), no. 2, Feb. 1975 p 108-111 (For availability see N75-24655 15-99)

A review of the results of research in the field of solid-state theory is presented. The following developments are discussed: application of quantum-chemical methods to solid-state theory; the theory of quasi-phase transformations; the effects of lattice vibrations on the optical spectra; studies on diluted magnetic alloys; and the theoretical aspects of electron structure and band structure of solids. J.M.S.

N75-24659 Joint Publications Research Service, Arlington, Va.
SETUP OF ADMINISTRATIVE COMPUTER SERVICE DESCRIBED **c60**
Pal Konyves-Toth *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 16-19 Transl. into ENGLISH from Szamitastechnika (Budapest), v. 6, no. 3, Mar. 1975 p 1/5 (For availability see N75-24655 15-99)

A computer-technology facility with a data teleprocessing network is described which fulfills the needs of institutions of national jurisdiction in Hungary in the field of computerization. Various aspects of the preparation and installation of the computer service are detailed, including the following: surveying the needs of users; determination of required equipment and selection of suppliers of equipment; recruiting and training personnel; and support of the programming and coordination of user functions. J.M.S.

N75-24660 Joint Publications Research Service, Arlington, Va.
ROMANIAN COMPUTERS AND OFFICE EQUIPMENT DESCRIBED **c60**
Dinu Buznea *In its* Transl. on Eastern Europe: Sci. Affairs, No. 464 (JPRS-64751) 13 May 1975 p 24-33 Transl. into ENGLISH from Electrotehn., Electron., si Automatica; Automatica si Electron. (Bucharest), no. 1, Mar. 1975 p 1-6 (For availability see N75-24655 15-99)

The development of a computer industry within Romania is described. The following major areas are discussed: intermediate and small capacity computers; the 16 kiloocet memory module; peripheral equipment and terminals; the SID-32 system for entering data on magnetic discs; the SEC specialized minicomputer; office machines with 4 operations, billing and accounting machines; and achievements in basic programs (software). J.M.S.

N75-24661 Joint Publications Research Service, Arlington, Va.
RESEARCH LAB AT TURDA ELECTROCERAMICA PLANT DESCRIBED **c33**
Andrian Savu and Peak Francisc *In its* Transl. on Eastern Europe: Sci. Affairs, no. 464 (JPRS-64751) 13 May 1975 p 34-44 refs Transl. into ENGLISH from Electrotehn., Electron., si Automatica; Electrotehn. (Bucharest), no. 1, Jan. 1975 p 40-46 (For availability see N75-24655 15-99)

The Electroceramica Plant which produces high voltage insulators and ceramic insulators for electric installations and has established control laboratories and high voltage test stands to satisfy the needs of production is described. Emphasis is placed on applying the results of research to improve manufacturing technology. Author

N75-24662# Joint Publications Research Service, Arlington, Va.

SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 348
15 May 1975 38 p refs Transl. into ENGLISH from various Russian reports
(JPRS-64770) Avail: NTIS HC $3.75

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports. Published details of Soviet space flight are included. Author

N75-24663# Naval Research Lab., Washington, D.C.
REPORT OF NRL PROGRESS
Nov. 1974 46 p refs
(PB-238901/3) Avail: NTIS HC $3.75 Also available from NTIS on subscription $40.00/year domestic, $50.00/year foreign CSCL 05B

Progress is presented on Naval research projects. Topics discussed include plasma physics, acoustics, fracture mechanics, magnetic materials, ray tracing, underwater acoustics, linear programming, stainless steels, radio communication, radar, ionospherics, spacecraft control, rust, gallium arsenides, and radiation effects. M.J.S.

N75-24664# Naval Research Lab., Washington, D.C.
REPORT OF NRL PROGRESS
Dec. 1974 54 p refs
(PB-238839/5) Avail: NTIS HC $4.25 Also available from NTIS on subscription $40.00/year domestic, $50.00/year foreign CSCL 05B

Progress on research projects is discussed along with patents. Topics discussed include theoretical and numerical simulation studies of ionospheric irregularities, antennas, electronics, metallurgy, ocean sciences, ocean technology, optical radiation, radar, space science, and reader service. M.J.S.

N75-24665# Aerospace Defense Command, Ent AFB, Colo.
AEROSPACE DEFENSE COMMAND WEAPON SYSTEM EVALUATION PROGRAM PLAN (WSEP)
1 Jan. 1975 53 p
(AD-A007690) Avail: NTIS CSCL 15/3

This plan is responsive to USAF Directive 74-5, Weapon System Evaluation Program. It implements the program within the Aerospace Defense Command, and provides detailed instructions for the conduct and operation of Phase II of the program. Phase II is the live firing evaluation program conducted at Tyndall AFB, Florida under the nickname COMBAT PIKE. The conduct of Phase II is the primary subject of this plan. GRA

N75-24666# Mathematics and Computation Lab., McLean, Va.
READY 1 SYSTEM FOR THE UNIVAC 1108 WEAPONS EFFECT PROGRAM Final Report
Nov. 1974 34 p Revised
(PB-239293/4; GSA/OP/MCL-TM-231-Rev-1) Avail: NTIS HC $3.75 CSCL 15F

This computer program, part of the READY 1 system, computes the effects of a specific nuclear attack on a set of resource points and produces a binary output tape containing the computed information. GRA

N75-24667# Mathematics and Computation Lab., McLean, Va.
READY 1 SYSTEM FOR THE UNIVAC 1108 WEAPONS PREPARATION PROGRAM Final Report
Nov. 1974 26 p Revised
(PB-239294/2; GSA/OP/MCL-TM-234-Rev-1) Avail: NTIS HC $3.75 CSCL 15F

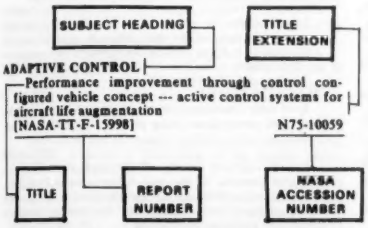
This technical manual contains detailed instructions for users of the weapons preparation program. It contains information concerning the several options of the program, input/output formats, and operating procedures. GRA

N75-24668# Mathematics and Computation Lab., McLean, Va.
READY 1 SYSTEM FOR THE UNIVAC 1108 ATTACK CONDITIONS PROGRAM Final Report
Nov. 1974 31 p Revised
(PB-239295/9; GSA/OP/MCL-TM-235-Rev-1) Avail: NTIS HC $3.75 CSCL 15F

The attack conditions program is designed to provide the READY 1 weapon effects program with a file containing weapon fallout trajectories. The program is designed to be run on a UNIVAC 1108 computer in conjunction with the READY 1 damage assessment system. GRA

SUBJECT INDEX

TYPICAL SUBJECT INDEX LISTING



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A

A-7 AIRCRAFT
Isolating nozzle afterbody interaction parameters and size effects: A new approach --- flight and wind tunnel tests with A 7 aircraft
N75-23503

ABERRATION
The effects of aberrations in synthetic aperture systems --- using optical transfer function, imaging techniques, and photographic equipment
[AD-A007774] N75-23954
The effects of abberrations in synthetic aperture systems
N75-24463

ABORTED MISSIONS
Abort separation study of a shuttle orbiter and external tank at hypersonic speeds
[NASA-TM-X-3212] N75-23651

ABSORBENTS
Mathematical simulation of an adsorber for pollutant removal
[PB-239331/2] N75-24194

ABSORBERS [MATERIALS]
Some new methods of determining and studying the absorptivity of a medium and the generalized angular coefficients of radiation
N75-24274

ABSORPTION
Temperature fields of an absorptive medium in a radiating system of arbitrary configuration [the spatial problem]
N75-24271

ABSORPTION SPECTRA
Transmissivity of carbon monoxide in the 2.3 microns band region
[NASA-CR-142869] N75-23726
Absorption and luminescence of glasses during electron irradiation
[BNL-19348] N75-23790
Influence of a strong static electrical field on the absorption spectrum of mylar polyester
[AD-A007864] N75-23795

ABSORPTION SPECTROSCOPY
Application of the radio frequency furnace technique to environmental trace analysis, part 1. The applicability of Hadamard Transform techniques to visible spectroscopy
N75-23722

ABSTRACTS
Abstract reports: Presented at the Meetings of the American Association for the Advancement of Science
[PB-239273/6] N75-24523

ACCELERATED LIFE TESTS
Sacrificial cage materials for the in-situ lubrication of rolling bearings --- accelerated service-simulation testing
N75-23999

ACCELERATION [PHYSICS]
Design of high speed moving pavements for mass transit
[TT-7410] N75-24545

ACCELEROMETERS
An automated system for precision calibration of accelerometers
[COM-75-10147/7] N75-23957
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement curves. Part Q and R: Accelerograms I1Q233 to I1Q243 and I1R244 to I1R254
[PB-239587/9] N75-24225

ACCESS TIME
The determination and evaluation of objective access times to public transit for disaggregate traveler behavior modeling
[PB-239212/4] N75-24551

ACETYLATION
Preferential release of newly synthesized acetylcholine by cortex slices from rat brain
[MBL-1974-34] N75-24339

ACOUSTICS
Electron photon interactions in semiconductors
N75-24465

ADDITIVES
Development of a bench procedure for evaluating the effectiveness of dispersant detergent gasoline additives, phase 2
[AD-A006580] N75-24018

ADDRESSING
Elements of address and adaptive radio telemetry systems, chapter 8
N75-23822

ADENOSINE TRIPHOSPHATE [ATP]
A changed ATP-dependent DNAase: The characterization of the enzyme from Escherichia coli rorA
[MBL-1974-38] N75-24314

ADHESION
Study of fiber reinforcement of thermoplastic polymers
N75-23695

ADHESIVES
Durability of adhesive bonded joints --- and surface preparation methods
[AD-A007873] N75-24010

ADRENAL GLAND
Catecholamine excretion from air cadets --- adrenal gland response
N75-24303

ADSORPTION
Variations in the work function of [100]W by the adsorption of oxygen, the adsorption of cesium and the coadsorption of oxygen and cesium
[NASA-TT-F-16364] N75-23725
The dynamics of adsorption of vapours by porous adsorbents in fixed beds. [Breakthrough curves of sarin on charcoal in the very low concentration region]
[TDCK-65300] N75-24167
Non-destructive test of charcoal filters. Part 3: Characteristics of the elution peaks of ethane and propane on partially spent charcoal filters of various moisture contents
[TDCK-65348] N75-24168

ADVECTION
Variational optimization analysis of temperature and moisture advection in a severe storm environment
[NASA-CR-141794] N75-24228

AERIAL PHOTOGRAPHY
Holographic stereogram conversion program
[AD-A007786] N75-23952
Broadband spectral photography of the James River
[NASA-TM-X-72689] N75-24068
Determining land use changes in watersheds by aerial photographic measurements
[PB-239192/8] N75-24080
Correlation of hydrologic model parameters with changing land use as determined from aerial photographs
[PB-239407/0] N75-24093

AERIAL RECONNAISSANCE
Multispectral aerial reconnaissance of parasitic attacks in forests: Remote sensing --- in France
N75-24052
Towards a Canadian policy on remote sensing from space, a special report to the Canadian Advisory Committee on Remote Sensing
[PB-238846/0] N75-24075

AERODYNAMIC CHARACTERISTICS
Aerodynamic characteristics of an axisymmetric body undergoing a uniform pitching motion
[AD-A007553] N75-23523
An experimental investigation of the aerodynamic characteristics of several nose mounted canard configurations at supersonic Mach numbers
[AD-A007793] N75-23526

AERODYNAMIC COEFFICIENTS
Hydroaerodynamic characteristics of a low aspect ratio delta wing near a screen
[AD-A007649] N75-23529

AERODYNAMIC CONFIGURATIONS
Subsonic and supersonic indicial aerodynamics and aerodynamic transfer function for complex configurations --- aerodynamic configurations for subsonic and supersonic speeds using the finite element method
[NASA-CR-142818] N75-23478
A finite element formulation for supersonic flows around complex configurations
[NASA-CR-142819] N75-23887

AERODYNAMIC DRAG
The measurement of the transonic spillage drag of a supersonic intake
N75-23488
An experimental investigation of the component drag composition of a two-dimensional inlet at transonic and supersonic speeds
N75-23489
Low speed injection effects on the aerodynamic performance at transonic speed
N75-23494
An experimental study of jet exhaust simulation
N75-23501
Exhaust plume temperature effects on nozzle afterbody performance over the transonic Mach number range
N75-23504
The influence of nacelle afterbody shape on airplane drag
N75-23505
Reynolds number effects on boattail drag of exhaust nozzles from wind tunnel and flight tests
N75-23506

AERODYNAMIC FORCES
Accounting of aerodynamic forces on airframe/propulsion systems --- for designing military aircraft
N75-23507

AERODYNAMIC INTERFERENCE
Airframe/propulsion interference
[AGARD-CP-150] N75-23485
Interaction problems between air intakes and aircraft
N75-23486
A criterion for prediction of airframe integration effects on inlet stability with application to advanced fighter aircraft
N75-23487
Jet interference of a podded engine installation at cruise conditions
N75-23490
Subsonic base and boattail drag, an analytical approach
N75-23492
Theory of mixing flow of a perfect fluid around an afterbody and a propulsive jet
N75-23493
Isolating nozzle afterbody interaction parameters and size effects: A new approach --- flight and wind tunnel tests with A 7 aircraft
N75-23503
Airframe/propulsion system flow field interference and the effect on air intake and exhaust nozzle performance
N75-23508
Detailed experimental and theoretical analysis of the aerodynamic interference between lifting jets and the fuselage and wing
N75-23509
Airframe: Engine interaction for engine configurations mounted above the wing. Part 1: Interference between wing and intake jet
N75-23511

AERODYNAMIC LOADS
Reproduction of the interaction of aerodynamic loads and structural distortions during strength tests
[AD-A007661] N75-23520
Method of the optimization of the load-carrying structure of wing on rigidity during variation by the distribution of thickness ratio
[AD-A007317] N75-23521
Calculation of loads and deformations of sweptback wing with the aid of mechanical analog instruments
[AD-A007308] N75-23525
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 3
[NASA-CR-134445] N75-23657
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 4
[NASA-CR-134446] N75-23658
Airloads investigation of an 0.30-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 5
[NASA-CR-134447] N75-23659
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 6
[NASA-CR-134448] N75-23660
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 7
[NASA-CR-134449] N75-23661
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the arc 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 8
[NASA-CR-134450] N75-23662
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 9
[NASA-CR-141501] N75-23663
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140 A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for MACH range 0.6 to 1.4 [IA14A], volume 10
[NASA-CR-141502] N75-23664
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 11
[NASA-CR-141503] N75-23665

AERODYNAMIC NOISE
Research on helicopter rotor noise
[AD-A007261] N75-23608
Noise generation in transonic wind tunnels
[AD-A007688] N75-23614
An experimental investigation of the turbulent characteristics of co-axial jet flows and their role in aerodynamic noise generation
N75-24161

AERODYNAMICS
Nonstationary aerodynamics of arbitrary cascades in compressible flow
N75-23474
Aerodynamic design of cooling tower drift eliminators
[PB-238952/6] N75-24149

AEROELASTICITY
Some problems of modelling aeroelastic phenomena in a transonic tunnel
[AD-A007391] N75-23561
Comparison of flight measurements with predictions from aeroelastic models in the NASA Langley Transonic Dynamics Tunnel
[NASA-TM-X-72686] N75-23610

AERONAUTICAL SATELLITES
Data processor sizing for an Aeronautical Satellite Communications Center [ASCC]
[AD-A007624] N75-24408

AEROSOLS
Cloud physics: Experimental investigations
[TT-73-50032] N75-24250
Studies on propagation of microbes in the airborne state
[NASA-CR-142757] N75-24294
Study of the reaction of atomic oxygen with aerosols
[NASA-CR-2529] N75-24441

AEROSPACE ENVIRONMENTS
Space and nuclear research and technology
[NASA-NEWS-RELEASE-75-95] N75-23619
Summary of high efficiency silicon solar cell meeting held at NASA-Lewis
[NASA-TM-X-71729] N75-23681
Natural environment design criteria for the Solar Electric Propulsion Stage [SEPS]
[NASA-TM-X-64929] N75-23682

AEROSPACE MEDICINE
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 139
[NASA-SP-7011[139]] N75-24315

AEROSPACE VEHICLES
Comparison of flight measurements with predictions from aeroelastic models in the NASA Langley Transonic Dynamics Tunnel
[NASA-TM-X-72686] N75-23610

AEROTHERMODYNAMICS
Aerothermodynamic factors governing the response rate of gas turbines
N75-23576

AFRICA
Remote sensing applications to resource management problems in the sahel
[PB-239867/5] N75-24087

AFTERBODIES
Theory of mixing flow of a perfect fluid around an afterbody and a propulsive jet
N75-23493
Reynolds number effects on fore- and aftbody pressure drag
N75-23497
The subsonic base drag of cylindrical twin-jet and single-jet afterbodies
N75-23498
An experimental study of jet exhaust simulation
N75-23501
Isolating nozzle afterbody interaction parameters and size effects: A new approach --- flight and wind tunnel tests with A 7 aircraft
N75-23503
Exhaust plume temperature effects on nozzle afterbody performance over the transonic Mach number range
N75-23504
The influence of nacelle afterbody shape on airplane drag
N75-23505

AFTERBURNING
Afterburning regulation concepts
N75-23587

AGING [MATERIALS]
Strain energy on disk shaped GP zone --- in age hardening alloys
[LBL-3174] N75-23766

AIR CARGO
High-capacity transport planes as modern air freight systems
[NASA-TT-F-16396] N75-23533

AIR COOLING
Workshop Proceedings on Solar Cooling for buildings, held in conjunction with the Semiannual Meeting of the American Society of Heating, Refrigerating and Air Conditioning Engineers [ASHRAE]
[PB-239419/5] N75-24145

AIR FLOW
Study of a porous surface microphone sensor in an aerofoil --- air flow
[NASA-CR-137652] N75-23932
Electromagnetic fields generated by turbulent air flow and shock waves
[WTHD-68] N75-24431

AIR INTAKES
Airframe/propulsion interference
[AGARD-CP-150] N75-23485
Interaction problems between air intakes and aircraft
N75-23486
A criterion for prediction of airframe integration effects on inlet stability with application to advanced fighter aircraft
N75-23487
An experimental investigation of the component drag composition of a two-dimensional inlet at transonic and supersonic speeds
N75-23489
Airframe: Engine interaction for engine configurations mounted above the wing. Part 1: Interference between wing and intake jet
N75-23511
An air intake control system for a supersonic fighter aircraft
N75-23589

AIR JETS
A study of reacting free and ducted hydrogen/air jets
[NASA-TM-X-72678] N75-23571
Multiple jet study data correlations --- data correlation for jet mixing flow of air jets
[NASA-CR-134795] N75-23572

AIR POLLUTION
An indirect method for measuring surface based temperature inversions --- air pollution monitoring
[AD-A007872] N75-23950
Infrared gas filter correlation instrument for in-situ measurement of gaseous pollutants
[PB-239467/4] N75-23956
On the relative merits of using either CW helium-cadmium or pulsed nitrogen lasers as the flourescence excitation source in airborne laser flourosensing systems
[PB-238845/2] N75-23974
Transient operation of a steady state burner --- continuous flow combustion for low pollution automobile engines
N75-24095
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region --- air pollution control studies in Virginia
[NASA-CR-142820] N75-24120
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region. Attachment 3: Data set for Craney Island oil refinery installation experiment --- air pollution monitoring
[NASA-CR-142823] N75-24121
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 4: Data set for background investigation of atmospheric constituents for Nansemond River site --- a proposed oil refinery site
[NASA-CR-142821] N75-24122
Real-time characterization of particles emitted by coal-fired power generating plant --- air pollution control
N75-24160
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 5: Data set for background investigation of atmospheric constituents for Richmond, Virginia area --- air pollution monitoring
[NASA-CR-142822] N75-24164
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, May 1973
N75-24165
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, Jun. 1973
N75-24166
Guidelines for air quality maintenance planning and analysis. Volume 2. Plan preparation
[PB-237581/4] N75-24169
Guidelines for air quality maintenance planning and analysis. Volume 3: Control strategies
[PB-237582/2] N75-24170
Guidelines for air quality maintenance planning and analysis. Volume 4: Land use and transportation considerations
[PB-237583/0] N75-24171
Guidelines for air quality maintenance planning and analysis. Volume 6. Overview of air quality maintenance area analysis
[PB-237584/8] N75-24172
Guidelines for air quality maintenance planning and analysis. Volume 7. Projecting county emissions
[PB-237611/9] N75-24173
Guidelines for air quality maintenance planning and analysis. Volume 8: Computer-assisted area source emission gridding procedure
[PB-237585/5] N75-24174
Guidelines for air quality maintenance planning and analysis. Volume 10: Reviewing new stationary sources
[PB-237535/0] N75-24175
Guidelines for air quality maintenence planning and analysis: Volume 11: Air quality monitoring and data analysis
[PB-237626/7] N75-24176
Guidelines for air quality maintenance planning and analysis. Volume 12: Applying atmospheric simulation models to air quality maintenance areas
[PB-237750/5] N75-24177
Relative dispersion within the Los Angeles Basin as estimated from Tetroon triads
[COM-75-10197/2] N75-24181
Biography on the planning aspects of air pollution control, summary and evaluation
[PB-238927/8] N75-24182
Field testing: Application of combustion modifications to control pollutant emissions from industrial boilers, phase I
[PB-238920/3] N75-24185
Engineering and cost study of air pollution control for the petrochemical industry. Volume 1: Carbon black manufacture by the furnace process
[PB-238324/8] N75-24189
Droplet diameter and size distribution of JP-4 fuel injected into a subsonic airstream
[AD-A007687] N75-24192
Mathematical simulation of an adsorber for pollutant removal
[PB-239331/2] N75-24194
Preliminary assessment of the environmental problems associated with vinyl chloride and polyvinyl chloride
[PB-239110/0] N75-24196
Comprehensive technical report on all atmospheric contaminants associated with photochemical air pollution
[PB-239510/1] N75-24197
Analysis of the composition of the atmosphere in the Los Angeles Basin
[PB-239466/6] N75-24199
Refractometric measurements in the Lacq area
N75-24206

Construction of a monolingual thesaurus on atmospheric pollution --- French language
N75-24531

AIR PURIFICATION
Non-destructive test of charcoal filters. Part 3: Characteristics of the elution peaks of ethane and propane on partially spent charcoal filters of various moisture contents
[TDCK-65348] N75-24168

AIR QUALITY
Guidelines for air quality maintenance planning and analysis. Volume 2. Plan preparation
[PB-237581/4] N75-24169
Guidelines for air quality maintenance planning and analysis. Volume 3: Control strategies
[PB-237582/2] N75-24170
Guidelines for air quality maintenance planning and analysis. Volume 4: Land use and transportation considerations
[PB-237583/0] N75-24171
Guidelines for air quality maintenance planning and analysis. Volume 6. Overview of air quality maintenance area analysis
[PB-237584/8] N75-24172
Guidelines for air quality maintenance planning and analysis. Volume 7. Projecting county emissions
[PB-237611/9] N75-24173
Guidelines for air quality maintenance planning and analysis. Volume 8: Computer-assisted area source emission gridding procedure
[PB-237585/5] N75-24174
Guidelines for air quality maintenance planning and analysis. Volume 10: Reviewing new stationary sources
[PB-237535/0] N75-24175
Guidelines for air quality maintenence planning and analysis: Volume 11: Air quality monitoring and data analysis
[PB-237626/7] N75-24176
Guidelines for air quality maintenance planning and analysis. Volume 12: Applying atmospheric simulation models to air quality maintenance areas
[PB-237750/5] N75-24177

AIR SAMPLING
Development of sampling devices for gaseous atmospheric tracers
[PB-238921/1] N75-23960

AIR TRAFFIC
Analysis of operational requirements for medium density air transportation. Volume 1: Summary
[NASA-CR-137603] N75-23534

AIR TRAFFIC CONTROL
An overview and assessment of plans and programs for the development of the upgraded third generation air traffic control system
[AD-A008940] N75-23531
Electromagnetic interference specification limits for air route traffic control centers
[AD-A008926] N75-23547
Consolidation of U.S. oceanic air traffic control centers in pre-aerosat era
[AD-A009299] N75-23548
Four-dimensional guidance algorithms for aircraft in an air traffic control environment
[NASA-TN-D-7829] N75-23549
Engineering and development program plan; en route control --- automatic flight data processing and air traffic control
[AD-A007623] N75-23550
Radar station evaluation report, Pease AFB, New Hampshire
[AD-A007041] N75-23553
Aerodrome air traffic control in the Canadian Forces --- design of tower cabs for air traffic controller tasks
[DCIEM-74-R-1067] N75-24363

AIR TRANSPORTATION
Analysis of operational requirements for medium density air transportation. Volume 1: Summary
[NASA-CR-137603] N75-23534
Saint Louis aviation forecast study: Technical supplement --- ground access analysis data
[PB-239058/1] N75-23535
Saint Louis aviation forecast study: Review of prior forecasts
[PB-239057/3] N75-23536
Saint Louis aviation forecast study
[PB-239056/5] N75-23537
Saint Louis aviation forecast study: Executive summary
[PB-239055/7] N75-23538

AIR WATER INTERACTIONS
The D sub m[kappa, alpha 1..., alpha sub m function in the ocean-continent transfer problem
N75-24269
Determining the parameters of the prognostic operator for undamped fluctuations by the use of the D sub m[kappa; alpha 1,..., alpha sub m]
N75-24270
Long-distance recording of the humidity over the sea
N75-24278
Distribution of energy in the ocean and atmosphere as a result of their thermal and dynamic interactions
N75-24280
Collected reprints: 1973. Atlantic oceanographic and meteorological laboratories
[COM-75-50164/3] N75-24283

AIRBORNE/SPACEBORNE COMPUTERS
An application of modern control theory to jet propulsion systems --- considering onboard computer
[NASA-TM-X-71726] N75-23573

AIRCRAFT BRAKES
Research about effects of external flow and aircraft installation conditions on thrust reversers performances
N75-23495

AIRCRAFT CARRIERS
A pilot/LSO simulation conducted to investigate aircraft wave-off performance and to determine the ability of the landing signal officer to judge aircraft approaches
[AD-A007515] N75-24356

AIRCRAFT COMPARTMENTS
A study of helicopter interior noise reduction
[NASA-TM-X-72655] N75-23556

AIRCRAFT CONFIGURATIONS
Prediction of the optimum location of a nacelle shaped body on the wing of a wing-body configuration by inviscid flow analysis
N75-23510
Airframe: Engine interaction for engine configurations mounted above the wing. Part 2: Engine jet simulation problems in wind tunnel tests
N75-23512

AIRCRAFT DESIGN
Effect of external conditions on the functioning of a dual flow supersonic nozzle --- designing propulsion system of military aircraft
N75-23491
Accounting of aerodynamic forces on airframe/propulsion systems --- for designing military aircraft
N75-23507
Computer-augmented design of aircraft wing structures
N75-23554
Design and analysis of a supersonic penetration/maneuvering fighter
[NASA-CR-132633] N75-23558
A formal structure for advanced automatic flight-control systems
[NASA-TN-D-7940] N75-23606

AIRCRAFT ENGINES
Airframe: Engine interaction for engine configurations mounted above the wing. Part 1: Interference between wing and intake jet
N75-23511
Airframe: Engine interaction for engine configurations mounted above the wing. Part 2: Engine jet simulation problems in wind tunnel tests
N75-23512
The state of the art in oil quality gaging on US military and commercial aircraft
[AD-A007682] N75-23565
Power plant controls for aero-gas turbine engines
[AGARD-CP-151] N75-23575
An airframe manufacturer's requirements for future propulsion controls
N75-23578
Control system requirements dictated by optimization of engine operation
N75-23579
Control design considerations for variable geometry engines
N75-23583
Aircraft engine nacelle fire test simulator
[AD-A007853] N75-23617

AIRCRAFT GUIDANCE
Four-dimensional guidance algorithms for aircraft in an air traffic control environment
[NASA-TN-D-7829] N75-23549

AIRCRAFT INDUSTRY
Country market survey. Avionics and aviation support equipment, Australia
[COM-75-50072-017] N75-24540

AIRCRAFT LANDING
Aerodynamic aspects and optimisation of thrust reverser systems
N75-23513
Implications of equipping a DC-8-61 fleet with RNAV/two-segment approach avionics
[NASA-CR-137680] N75-23544
A pilot/LSO simulation conducted to investigate aircraft wave-off performance and to determine the ability of the landing signal officer to judge aircraft approaches
[AD-A007515] N75-24356
Aviator visual performance in the UH-1 study 2
[AD-A007812] N75-24357

AIRCRAFT MAINTENANCE
Repair dock for large aircraft
[AD-A007399] N75-23613

AIRCRAFT MODELS
A model technique for exhaust system performance testing
N75-23502

AIRCRAFT NOISE
CF5D aircraft cockpit-noise reduction
[DCIEM-74-R-1048] N75-23564
The development of experimental techniques for the study of helicopter rotor noise
[NASA-CR-137684] N75-23611
Civil aviation studies and interagency coordinating organizations, volume 1 --- aircraft noise reduction
[PB-239344/5] N75-24186
Civil aviation studies and interagency coordinating organizations, volume 2: Appendices --- aircraft noise reduction
[PB-239345/2] N75-24187

AIRCRAFT PERFORMANCE
Low speed injection effects on the aerodynamic performance at transonic speed
N75-23494
Research about effects of external flow and aircraft installation conditions on thrust reversers performances
N75-23495
A model technique for exhaust system performance testing
N75-23502

AIRCRAFT SAFETY
A crashworthy armored pilot seat for helicopters
[AD-A007551] N75-23541

AIRCRAFT STABILITY
The influence of short springs on longitudinal static stability
[CRANFIELD-AERO-29] N75-23607

AIRCRAFT STRUCTURES
Reproduction of the interaction of aerodynamic loads and structural distortions during strength tests
[AD-A007661] N75-23520
Program to improve the fracture toughness and fatigue resistance of aluminum sheet and plate for aircraft applications, volume 2
[AD-A003417] N75-23775
Fatigue properties of aircraft lugs with interference fit
[TAE-243] N75-24031

AIRCRAFT TIRES
The effect of chine tires on nose gear water-spray characteristics of a twin engine airplane
[NASA-TM-X-72695] N75-23555

AIRCRAFT WAKES
Experimental study of the effect on span loading on aircraft wakes
[NASA-TM-X-62431] N75-23479

AIRFIELD SURFACE MOVEMENTS
The effect of chine tires on nose gear water-spray characteristics of a twin engine airplane
[NASA-TM-X-72695] N75-23555

AIRFOILS
Effectiveness of spoilers on the GA[W]-1 airfoil with a high performance Fowler flap
[NASA-CR-2538] N75-23484

AIRFRAMES
Airframe/propulsion interference
[AGARD-CP-150] N75-23485
Interaction problems between air intakes and aircraft
N75-23486
A criterion for prediction of airframe integration effects on inlet stability with application to advanced fighter aircraft
N75-23487
Twin jet exhaust system test techniques --- integrating airframe and propulsion system for wind tunnel models
N75-23500
Accounting of aerodynamic forces on airframe/propulsion systems --- for designing military aircraft
N75-23507
Airframe/propulsion system flow field interference and the effect on air intake and exhaust nozzle performance
N75-23508
Airframe: Engine interaction for engine configurations mounted above the wing. Part 1: Interference between wing and intake jet
N75-23511
Airframe: Engine interaction for engine configurations mounted above the wing. Part 2: Engine jet simulation problems in wind tunnel tests
N75-23512
Subscale, hydrogen-burning, airframe-integrated-scramjet: Experimental and theoretical evaluation of a water cooled strut airframe-integrated-scramjet: Experimental leading edge
[NASA-TM-X-72682] N75-23885
Nondestructive holographic techniques for structures inspection
[AD-A007850] N75-23946

AIRPORT PLANNING
Construction of a dynamic airport system
[TT-7408] N75-23612

AIRPORTS
Saint Louis aviation forecast study: Technical supplement --- ground access analysis data
[PB-239058/1] N75-23535
Saint Louis aviation forecast study: Review of prior forecasts
[PB-239057/3] N75-23536
Saint Louis aviation forecast study
[PB-239056/5] N75-23537

The airport/urban interface
[PB-238914/6] N75-23618

ALASKA
Health care and satellite radio communication in village Alaska
[PB-238742/1] N75-24343

ALGORITHMS
Four-dimensional guidance algorithms for aircraft in an air traffic control environment
[NASA-TN-D-7829] N75-23549
Space vehicle Viterbi decoder --- data converters, algorithms
[NASA-CR-141787] N75-23672
Design of FIR digital filters for pulse shaping and channel equilization using time-domain optimization
N75-23817
Theory and practice of geophysical survey design --- track-type geophysical surveys and algorithms applied to sampling problems
N75-24203
Using blossoms to find maximum matchings on graphs
[PB-238971/6] N75-24377
A digital algorithm for spectral deconvolution with noise filtering and peak picking: NOFIPP-DECON
[NASA-TM-X-64927] N75-24383
Some experiments on the accuracy of three methods of updating the inverse in the simplex method
[AD-A007148] N75-24399
Methods for computing and modifying the LDV factors of a matrix
[NPL-NAC-56] N75-24421

ALKALI HALIDES
Casting of halide and flouride alloys for laser windows
[AD-A007656] N75-24468

ALKALINE EARTH COMPOUNDS
Applied research on 2 - 6 compound materials for heterojunction solar cells
[PB-239184/5] N75-24146

ALL SKY PHOTOGRAPHY
Temporal X-ray astronomy with a pinhole camera -- - cygnus and scorpius constellation
[NASA-TM-X-70893] N75-24596

ALLOYS
A chemical bond approach to metals and alloys
N75-23744

ALTERNATING CURRENT
Practical stability of a reluctance synchronous machine
[AD-A007659] N75-23605

ALTIMETERS
Calibration and evaluation of Skylab altimetry for geodetic determination of the geoid
[E75-10282] N75-24055

ALUMINATES
Densification-mechanism modeling of the pressure-sintering behavior of MgAl2O4
N75-23984

ALUMINUM
Characteristics of crack propagation at the interface between two dissimilar media, phase 1
[AD-A007293] N75-23714
Calculations of laser induced spall in aluminum targets
[LA-5619-MS-REV] N75-23968
Neutron scattering and magnetization measurements on the Kondo compound CeAl3
[CONF-741202-13] N75-24450

ALUMINUM ALLOYS
Mechanical properties of aluminum alloy-graphite fiber composites --- metal matrix composites
[AD-A007779] N75-23715
Investigation of smooth specimen scc test procedures; variations in environment, specimen size, stressing frame, and stress state --- for high strength aluminum alloys
[NASA-CR-120752] N75-23758
Program to improve the fracture toughness and fatigue resistance of aluminum sheet and plate for aircraft applications, volume 2
[AD-A003417] N75-23775
Performance improvement of aluminum and titanium based alloys by new tempering methods for cooling acceleration and reduction of residual stresses
N75-24029
Fatigue properties of aircraft lugs with interference fit
[TAE-243] N75-24031

ALUMINUM COATINGS
Examination of the influence of coatings on thin superalloy sections. Volume 1: Description and analysis
[NASA-CR-134791] N75-23755

ALUMINUM COMPOUNDS
Excitations and magnetic properties of rare-earth Al2 compounds
[RISO-312] N75-23772

ALUMINUM NITRIDES
Piezoelectric aluminum nitride films
[AD-A007657] N75-24518

ALUMINUM OXIDES
Optimal densification of ceramics by rate controlled sintering
[AD-A007339] N75-23792
Electron microscopic observations of microcracking about indentations in aluminum oxide and silicon carbide
[AD-A007445] N75-23794

AMMONIA
Conversion of cattle feedlot wastes to ammonia synthesis gas
[PB-239668/7] N75-23692

AMMUNITION
Minutes of the 16th Explosives Safety Seminar, volume 1 --- including ammunition and propellant storability
[AD-A007557] N75-23801
Minutes of the 16th Explosives Safety Seminar, volume 2 --- including ammunition and propellant storability
[AD-A007566] N75-23802

AMORPHOUS SEMICONDUCTORS
A study of the physical properties and bistable conduction characteristics of amorphous bismuth thioxide thin films
N75-24493
The effects of topology on the properties of random network models for amorphous Group 4 semiconductors --- germanium, silicon, and energy bands
N75-24495

ANALOG COMPUTERS
Implications of equipping a DC-8-61 fleet with RNAV/two-segment approach avionics
[NASA-CR-137680] N75-23544

ANALYZERS
An automated molecular fluorescence/absorption sequential analyzer with laser source
N75-23911

ANELASTICITY
Anelastic deformation of boron fibers --- vapor deposited fibers
[NASA-TM-X-71710] N75-23697

ANGLE OF ATTACK
Unsteady stall of a slender elliptic cylinder in a freestream of sinusoidally varying angle of incidence
N75-23473

ANISOTROPIC PLATES
Static, vibration, and stability analyses of anisotropic plates
N75-24020
Non-linear wave propagation in heterogeneous anisotropic plates
N75-24428

ANISOTROPY
The effect of anisotropy on the piezoelectric polaron --- Hamiltonian functions
N75-24489

ANNIHILATION REACTIONS
A modified parton model for reactions with time-like photons --- comprised of a pair of valence quarks and other particles
[PM/75/4] N75-24457

ANNUAL VARIATIONS
Spring and fall thermal bar development in Lake Superior
[PB-239227/2] N75-24184

ANNULAR NOZZLES
Analysis of fluid flow in the entrance region of a duct with an eccentric annular cross-section
N75-23472

ANOMALOUS TEMPERATURE ZONES
The role of large-scale atmospheric circulation in the formation of temperature anomalies in surface waters as illustrated by the northern part of the Pacific Ocean
N75-24266

ANTENNA ARRAYS
A simplified technique for phase control of conformal arrays
[AD-A007486] N75-23835
Microwave holography for analysis of conformal arrays --- antenna radiation patterns
[AD-A007359] N75-23953

ANTENNA COMPONENTS
Radiation pattern, reactive power, and resistive aperture antennas --- plane waves
[AD-A007675] N75-23840

ANTENNA RADIATION PATTERNS
A simplified technique for phase control of conformal arrays
[AD-A007486] N75-23835
Radiation pattern, reactive power, and resistive aperture antennas --- plane waves
[AD-A007675] N75-23840
Microwave holography for analysis of conformal arrays --- antenna radiation patterns
[AD-A007359] N75-23953

ANTENNAS
Caustic matching: A new technique for improving limited-scan antennas
[AD-A007665] N75-23831

ANTIAIRCRAFT MISSILES
Parametric analysis of an advanced manned interceptor utilization
[AD-A007663] N75-23563
TACOS 2 documentation. Volume 3D: TERAIN, PMAP, SORTEV user/planner manual --- for antimissile and antiaircraft defense systems
[AD-782158] N75-24396
Aerospace Defense Command Weapon System Evaluation Program plan [WSEP]
[AD-A007690] N75-24665

ANTIBODIES
Fast and easy production of monolayer plaque assay slides
[MBL-1974-31] N75-24336

ANTIFERROELECTRICITY
Nonlinear conversion of ferroelectric energy and energy conversion by forced transition with Pb[Zr sub [1-x]Ti sub x]O3 ceramics
N75-23805

ANTIMISSILE DEFENSE
TACOS 2 documentation. Volume 3D: TERAIN, PMAP, SORTEV user/planner manual --- for antimissile and antiaircraft defense systems
[AD-782158] N75-24396

ANTIMONIDES
SbSI physical properties near the ferroelectric phase change point
N75-24501

ANTIREFLECTION COATINGS
Development of optical coatings for high-intensity laser applications
[AD-A007692] N75-24470

APERTURES
The effects of abberrations in synthetic aperture systems
N75-24463

APOLLO PROJECT
History of manned space flight
[NASA-TM-X-66817] N75-24641

APOLLO SOYUZ TEST PROJECT
The Apollo-Soyuz test flight
[NASA-TT-F-16386] N75-23621
The Soyuz and Apollo spacecraft
[NASA-TT-F-16371] N75-23622
Apollo Soyuz test project press kit: USA-USSR
[NASA-NEWS-RELEASE-75-118] N75-23623
The Soyuz: Ready for flight
[NASA-TT-F-16369] N75-23646

APOLLO TELESCOPE MOUNT
ATM CMG/EPEA
[NASA-CR-120760] N75-23673
Experimental investigation and model development of the Skylab ATM secondary nickel-cadmium batteries
[NASA-CR-120749] N75-24097

APOLLO 9 FLIGHT
A survey of earth resources on Apollo 9 photography
[NASA-CR-142900] N75-24063

APPROACH CONTROL
Post-test navigation data analysis techniques for the shuttle ALT
[NASA-CR-141789] N75-23629
A pilot/LSO simulation conducted to investigate aircraft wave-off performance and to determine the ability of the landing signal officer to judge aircraft approaches
[AD-A007515] N75-24356

APPROPRIATIONS
Department of Housing and Urban Development-independent agencies appropriations for 1976. Part 2: National Aeronautics and Space Administration
[GPO-51-423] N75-24542

APPROXIMATION
The approximation of correlation functions --- using Fourier transformation
[AD-A007664] N75-24423

ARCTIC OCEAN
Differential sea ice drift
[AD-A007733] N75-24048

AREA NAVIGATION
Implications of equipping a DC-8-61 fleet with RNAV/two-segment approach avionics
[NASA-CR-137680] N75-23544

ARGON PLASMA
Generation of monochromatic electrostatic waves of large amplitudes in a bounded beam-plasma system
[LRP-88/74] N75-24481

ARID LANDS
More water for arid lands, promising technologies and research opportunities
[PB-239472/4] N75-24089

ARIEL SATELLITES
Temporal X-ray astronomy with a pinhole camera -- - cygnus and scorpius constellation
[NASA-TM-X-70893] N75-24596

ARM [ANATOMY]
On the acceptance, functional gain and mental load in arm prosthesis and orthosis control
[WTHD-66] N75-24355

ASSAYING
Fast and easy production of monolayer plaque assay slides
[MBL-1974-31] N75-24336

ASSEMBLY LANGUAGE
APS-73 cross assembler reference manual --- symbolic programming
[PB-238821/3] N75-24403

ASTRIONICS
Astrionic system optimization and modular astrionics for NASA missions after 1974. Preliminary

definition of astrionic system for space tug Mission Vehicle Payload [MVP]
[NASA-CR-120618] N75-23627

ASTRONOMICAL MAPS
High-resolution maps of H2 regions at far-infrared wavelengths --- balloon-borne cassegrain telescope
N75-24567

ASTRONOMICAL MODELS
An empirical model for the structure of the Orion nebula
N75-24574
Evolutionary characteristics of a bimodal grain model --- interstellar grains
N75-24576
Dust in H2 regions --- theoretical models of dusty nebulae
N75-24577
Infrared radiation model for the galactic centre --- interstellar dust heated by stellar radiation
N75-24587
Interplanetary charged particle models [1974] --- and the effects of cosmic exposure upon spacecraft and spacecraft components
[NASA-SP-8118] N75-24607

ASTRONOMICAL PHOTOGRAPHY
The Orion nebula: A photographic study of spatial structure
N75-24556
Optical, infrared and radio observations of two H2 regions
N75-24559

ASTRONOMICAL PHOTOMETRY
Photometry in the 3200-9000 A range on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16347] N75-23923
Far infrared photometry of H2 regions --- balloon-borne telescopy
N75-24565
Multicolour far-infrared photometry of the galactic centre region --- balloon-borne instruments
N75-24586

ASTRONOMY
Astronomy at sub-millimeter wavelengths --- using telescopes mounted on gondolas
[NASA-CR-142814] N75-23927

ATLANTIC OCEAN
Consolidation of U.S. oceanic air traffic control centers in pre-aerosat era
[AD-A009299] N75-23548
Summary of synoptic meteorological observations Caribbean and nearby island coastal marine areas. Volume 2: Area 7 - Cayman, area 8 - Jamaica west, area 9 - Jamaica south, area 10 - Jamaica north, area 11 - Jamaica south-east
[AD-A001031] N75-24235
Summary of synoptic meteorological observations Caribbean and near by island coastal marine areas. Volume 4: Areas 18 - Hispaniola north, area 19 - Santo Domingo, area 20 - Mona Passage, area 21 - Puerto Rico south, area 22 - Puerto Rico north, area 23 - Vieques
[AD-A001457] N75-24236
Summary of synoptic meteorological observations. North American coastal marine areas, revised. Atlantic and Gulf Coasts. Volume 1. Revised. Area 1: Belle Isle Strait. Area 2: Osv Bravo. Area 3: NE Newfoundland coast. Area 4: SE Newfoundland coast. Area 5: Placentia Bay south. Area 6: Cabot Strait. Area 7: Anticosti Island
[AD-A006990] N75-24237
Bermuda environmental scenario
[AD-A007448] N75-24253
Coastal upwelling on the east of the tropical zone of the North Atlantic and its relation to the stability of the northeast tradewind
N75-24264
Collected reprints: 1973. Atlantic oceanographic and meteorological laboratories
[COM-75-50164/3] N75-24283
Energy exchange at the surface of the western North Atlantic Ocean
[AD-A007296] N75-24285

ATMOSPHERIC ATTENUATION
Deformation of the atmosphere by intense laser beams at 10.6 microns --- atmospheric effects
[DREV-TN-2099/74] N75-23965

ATMOSPHERIC BOUNDARY LAYER
Parameterization of the planetary boundary layer in atmospheric general circulation models, a review
[AD-A007579] N75-24251
An evaluation of the National Meteorological Center's experimental boundary layer model
[COM-75-10267/3] N75-24259

ATMOSPHERIC CHEMISTRY
Reaction rate data. Number 48: Annual summary of progress in FY 1974 DNA reaction rate program
[AD-A006574] N75-24216

ATMOSPHERIC CIRCULATION
Radioisotopes and global transport in the atmosphere
[TT-74-50025] N75-24190
Effects of meso-scale and small scale interactions on global climate. Volume 1: Orographic effects on global climate
[AD-A007034] N75-24247
Meso-scale and small-scale interactions on global climate. Volume 2: Radiation transport effects on global climate
[AD-A007035] N75-24248
Parameterization of the planetary boundary layer in atmospheric general circulation models, a review
[AD-A007579] N75-24251
Coastal upwelling on the east of the tropical zone of the North Atlantic and its relation to the stability of the northeast tradewind
N75-24264
The role of large-scale atmospheric circulation in the formation of temperature anomalies in surface waters as illustrated by the northern part of the Pacific Ocean
N75-24266
Solar activity and the motions of the upper atmosphere
N75-24267

ATMOSPHERIC DENSITY
The investigation of O and N2 densities from the OSO-7 extreme UV data
[NASA-CR-142759] N75-24644

ATMOSPHERIC DIFFUSION
Relative dispersion within the Los Angeles Basin as estimated from Tetroon triads
[COM-75-10197/2] N75-24181

ATMOSPHERIC EFFECTS
Deformation of the atmosphere by intense laser beams at 10.6 microns --- atmospheric effects
[DREV-TN-2099/74] N75-23965
Graphite fluoride lubrication: The effect of fluorine content, atmosphere, and burnishing technique
[NASA-TM-X-71733] N75-23988
Experimental evaluation of atmospheric effects on radiometric measurements using the EREP of Skylab --- Salt Lake Desert
[E75-10283] N75-24056

ATMOSPHERIC ENTRY
Optimum control of flight vehicle under the conditions of uncertainty
[AD-A007400] N75-23640
Space shuttle entry and landing navigation analysis
[NASA-CR-141765] N75-23654

ATMOSPHERIC MODELS
Guidelines for air quality maintenance planning and analysis. Volume 12: Applying atmospheric simulation models to air quality maintenance areas
[PB-237750/5] N75-24177
Mathematical simulation of smog chamber photochemical experiments
[PB-238094/7] N75-24180
The effects of field aligned ionization models on the electron densities and total flux tubes contents deduced by the method of whistler analysis
[AERONOMICA-ACTA-A-139-1974]
N75-24205
Parameterization of the planetary boundary layer in atmospheric general circulation models, a review
[AD-A007579] N75-24251
An evaluation of the National Meteorological Center's experimental boundary layer model
[COM-75-10267/3] N75-24259
A table of semiempirical gf values. Part 1: Wavelengths: 5.2682 nm to 272.3380 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142879] N75-24599
A table of semiempirical gf values. Part 2: Wavelengths: 272.3395 nm to 599.3892 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142880] N75-24600
A table of semiempirical gf values. Part 3: Wavelengths: 599.4004 nm to 9997.2746 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142881] N75-24601

ATMOSPHERIC MOISTURE
Variational optimization analysis of temperature and moisture advection in a severe storm environment
[NASA-CR-141794] N75-24228
Long-distance recording of the humidity over the sea
N75-24278

ATMOSPHERIC PHYSICS
Estimation of mixing ratio profiles over maritime areas by linear regression methods
[AD-A007654] N75-24217
Atmospheric phenomena --- auroras, electron states, nitrogen, nitrogen oxides
[AD-A007792] N75-24218
Zero-gravity atmospheric Cloud Physics Experiment Laboratory; Programmatics report
[NASA-CR-120725] N75-24526

ATMOSPHERIC TEMPERATURE
A high frequency platinum resistance thermometer system for measuring turbulent atmospheric temperature fluctuations
[AD-A007284] N75-23951
Variational optimization analysis of temperature and moisture advection in a severe storm environment
[NASA-CR-141794] N75-24228

ATMOSPHERIC TURBULENCE
A high frequency platinum resistance thermometer system for measuring turbulent atmospheric temperature fluctuations
[AD-A007284] N75-23951

ATOM CONCENTRATION
Correlation of materials properties with the atomic density concept
[NASA-CR-120751] N75-23727

ATOMIC COLLISIONS
Measurement of several rate coefficients for the He-Ne laser plasma
N75-24472

ATOMIC EXCITATIONS
Excitations and magnetic properties of rare-earth Al2 compounds
[RISO-312] N75-23772

ATOMIC PHYSICS
Correlation of materials properties with the atomic density concept
[NASA-CR-120751] N75-23727

ATOMIC STRUCTURE
Correlation of materials properties with the atomic density concept
[NASA-CR-120751] N75-23727
Study of alloy strengthening due to atomic order
[ORO-3935-43] N75-23769
Investigation of solar plasma near Mars and on Earth-Mars path by means of a charged-particle trap aboard Soviet spacecraft, 1971 - 1973. Part 3: Characteristics of plasma ion and electron components in the antisolar part of near-Martian space measured by Mars-5
[NASA-TT-F-16351] N75-24611

ATS 1
Health care and satellite radio communication in village Alaska
[PB-238742/1] N75-24343

ATS 6
Results of the 3 November 1974 Applications Technology Satellite-6 [ATS-6] trilateration test
[NASA-TM-X-70897] N75-23656
Cost competitiveness of a solar cell array power source for ATS-6 educational TV terminal
[NASA-TM-X-71720] N75-24110

ATTITUDE [INCLINATION]
Analysis of RAE-B attitude data
[NASA-CR-143793] N75-23632

ATTITUDE CONTROL
ATM CMG/EPEA
[NASA-CR-120760] N75-23673
Attitude control propulsion components, volume 1
[NASA-CR-136741-VOL-1] N75-23676
Attitude control propulsion components, volume 2
[NASA-CR-136741-VOL-2] N75-23677

AUDITORY DEFECTS
Human temporary threshold shift and recovery from 24 hour acoustic exposures
[AD-A007842] N75-24350

AUDITORY PERCEPTION
Changes in visual evoked response by non-visual task processing --- computer programs
N75-24301

AUDITORY STIMULI
Analysis of central nervous system involvement
[AD-A007581] N75-24345

AUGER SPECTROSCOPY
Investigation of hydrogen chemisorption on the tungsten [100] surface --- Auger spectroscopy
[AD-A007434] N75-23731

AUGMENTATION
Radiosensitization of biologically active DNA in cellular extracts by oxygen. Evidence that the presence of SH-compounds is not required
[MBL-1974-29] N75-24334

AURORAL ELECTROJETS
Auroral electroject magnetic activity indices AE[10] for 1966
[COM-74-50276/37] N75-24221

AURORAL ZONES
Electron precipitation in the post midnight sector of the auroral zones --- on the Explorer 40 satellite
[NASA-CR-142812] N75-24209

AURORAS
Atmospheric phenomena --- auroras, electron states, nitrogen, nitrogen oxides
[AD-A007792] N75-24218
The Anchorage, Alaska, real time auroral radar monitor: System description and some preliminary analyses
[COM-75-50114/8] N75-24241

AUSTENITE
The effect of grain size and retained austenite on the ductile-brittle transition of a titanium-gettered iron alloy
[AD-A007360] N75-23780

AUSTENITIC STAINLESS STEELS
Structure and properties of steels theromomechanically processed by impact extrusion
[AEC-IS-T-652] N75-23746
Corrosion of austenitic stainless steel alloys due to HNO3-HF mixtures
[ICP-1036] N75-23765

AUSTRALIA
Country market survey. Avionics and aviation support equipment, Australia
[COM-75-50072-017] N75-24540
AUTOMATIC CONTROL
Artificial heart controls support
[ORO-4485-2] N75-24365
AUTOMATIC FLIGHT CONTROL
Four-dimensional guidance algorithms for aircraft in an air traffic control environment
[NASA-TN-D-7829] N75-23549
Engineering and development program plan: en route control --- automatic flight data processing and air traffic control
[AD-A007623] N75-23550
A formal structure for advanced automatic flight-control systems
[NASA-TN-D-7940] N75-23606
AUTOMATIC PICTURE TRANSMISSION
Weather satellite picture receiving stations, APT digital scan converter
[NASA-TN-D-7994] N75-24231
AUTOMATIC TEST EQUIPMENT
An automated approach to some basic sample handling concepts
N75-23721
Modern analytical measuring instruments
[NASA-TT-F-16394] N75-23929
A unique concept for automatically controlling the braking action of wheeled vehicles during minimum distance stops
[NASA-TM-X-72665] N75-23987
Aviation: Automatic Weather Observing System [AV-AWOS] preliminary system description
[AD-A007697] N75-24229
AUTOMATIC TYPEWRITERS
The lightspot operated typewriter: The evaluation of a prototype
[WTHD-65] N75-24364
AUTOMOBILE ACCIDENTS
Development and evaluation of automobile crash sensors
[PB-237940/2] N75-23939
AUTOMOBILE ENGINES
The oxidation of ethylene in automotive engine exhaust gas; an experimental investigation
N75-23719
Transient operation of a steady state burner --- continuous flow combustion for low pollution automobile engines
N75-24095
Aerodynamic design of a free power turbine for a 75 KW gas turbine automotive engine
[NASA-TM-X-71714] N75-24106
Improved suppression of radiation from automobiles used by the general public
[PB-239471/6] N75-24553
AVIONICS
Country market survey. Avionics and aviation support equipment, Australia
[COM-75-50072-017] N75-24540
AXIAL COMPRESSION LOADS
Design and fabrication of Rene 41 advanced structural panels --- their performance under axial compression, shear, and bending loads
[NASA-CR-132646] N75-24032
AXIAL FLOW TURBINES
Aerodynamic design of a free power turbine for a 75 KW gas turbine automotive engine
[NASA-TM-X-71714] N75-24106
AXIAL LOADS
Numerical solution of the axisymmetric tasks of creep of circular cylindrical shells --- bending moments
[AD-A007476] N75-24042
AXISYMMETRIC BODIES
Aerodynamic characteristics of an axisymmetric body undergoing a uniform pitching motion
[AD-A007553] N75-23523
AXISYMMETRIC FLOW
Application of local linearization and the transonic equivalence rule to the flow about slender analytic bodies at Mach numbers near 1.0
[NASA-TM-X-72654] N75-23890

B

BACKSCATTERING
Ray-tracing simulation of swept-frequency backscatter ionograms
[AD-A007686] N75-23832
BACTERIOPHAGES
Punctuation of transcription in vitro of the tryptophan operon of Escherichia coli. A novel type of control of transcription
[MBL-1975-4] N75-24311
Mutagenesis by ultraviolet radiation in bacteriophage PHI X 174: On the mutation stimulating processes induced by ultraviolet radiation in the host bacterium
[MBL-1974-30] N75-24335
Transcription of bacteriophage Mu: An analysis of the transcription pattern in the early phase of development
[MBL-1974-36] N75-24341
BALL BEARINGS
On the effects of solid lubrication on the torque of a ball bearing --- D2B satellite
N75-24000
Composite self lubricating materials for space applications
N75-24005
Method for continuous torque measurement of dry miniature bearings --- using microbalance
N75-24006
A dry lubrication system for spaceproofed bearings --- Helios despin drives
N75-24008
BALLOON-BORNE INSTRUMENTS
Far infrared photometry of H2 regions --- balloon-borne telescopy
N75-24565
Far infrared observations of W51 and the galactic centre --- balloon-borne telescope system
N75-24566
High-resolution maps of H2 regions at far-infrared wavelengths --- balloon-borne cassegrain telescope
N75-24567
Multicolour far-infrared photometry of the galactic centre region --- balloon-borne instruments
N75-24586
BANACH SPACE
On minimax decision theory: A Banach space approach
N75-24525
BARIUM FLUORIDES
Determination of fluoride in fluomica and fluomica-alumina composites with the fluoride electrode
[AD-A007764] N75-23736
BARRIER LAYERS
Properties and potential of BARITT devices --- barrier injection transit time devices
N75-24491
BASE HEATING
Analysis of problems in rocket base heat transfer during the aspiration phase
N75-23675
BASIC [PROGRAMMING LANGUAGE]
Pulse Doppler ambiguity resolution --- basic programming language
[AD-A007416] N75-24415
BATCH PROCESSING
Load sharing in computer networks: A queueing model
N75-24424
BAYS [TOPOGRAPHIC FEATURES]
Tides and tidal currents of Narragansett Bay
[COM-75-10250/9] N75-24290
BEAMS [SUPPORTS]
Nonlinear vibration of three-layer beams
N75-24024
BEARINGS
Development of new space lubricants --- for despin satellite antenna drive bearings
N75-23997
Sacrificial cage materials for the in-situ lubrication of rolling bearings --- accelerated service-simulation testing
N75-23999
A testrig to measure the thermal conductance and friction torque of bearings in vacuum
N75-24001
Grease lubricated spiral groove bearings for long-life systems --- communication satellite momentum wheel
N75-24003
Research and development in the field of spacecraft mechanical devices --- collector rings and bearings
N75-24007
BEDS [PROCESS ENGINEERING]
The dynamics of adsorption of vapours by porous adsorbents in fixed beds. [Breakthrough curves of sarin on charcoal in the very low concentration region]
[TDCK-65300] N75-24167
Non-destructive test of charcoal filters. Part 3: Characteristics of the elution peaks of ethane and propane on partially spent charcoal filters of various moisture contents
[TDCK-65348] N75-24168
BELGIUM
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, May 1973
N75-24165
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, Jun. 1973
N75-24166
BENDING FATIGUE
An investigation of the effect of shot peening on the rotating bending fatigue endurance of chromium plated 18% Ni maraging steel
[AQD/U-000667] N75-23773
BENDING MOMENTS
Design and fabrication of Rene 41 advanced structural panels --- their performance under axial compression, shear, and bending loads
[NASA-CR-132646] N75-24032
Numerical solution of the axisymmetric tasks of creep of circular cylindrical shells --- bending moments
[AD-A007476] N75-24042
BENDING VIBRATION
Nonlinear vibration of three-layer beams
N75-24024
BERMUDA
Bermuda environmental scenario
[AD-A007448] N75-24253
BERYLLIUM
Feasibility studies on the radiochemical lithium solar neutrino experiment
[BNL-19300] N75-24442
BIBLIOGRAPHIES
Bibliography on contaminants and solubility of organic compounds in oxygen
[NASA-TM-X-71700] N75-23688
Silicon nitride for structural applications: An annotated bibliography
[AD-A007270] N75-23791
Bibliography of the Electromagnetics Division, 30 June 1973 - 30 June 1974
[COM-75-10161/8] N75-23842
Energy: A continuing bibliography with indexes, February 1975 --- solar energy, energy conversion
[NASA-SP-7043(03)] N75-24094
Catalog of particles and fields data 1958-1965
[NASA-TM-X-72574] N75-24211
Catalog of particles and fields data 1966-1973
[NASA-TM-X-72575] N75-24212
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 139
[NASA-SP-7011(139)] N75-24315
NSF-RANN energy abstracts. A monthly abstract journal of energy research
[ORNL-EIS-74-52-VOL-2-NO-6] N75-24532
BINARY SYSTEMS [MATERIALS]
Nuclear magnetic resonance studies of glasses and related crystalline materials
N75-23784
BIOASSAY
Annual conference on Bioassay [20th], Environmental, and Analytical Chemistry
[PB-238772/8] N75-23693
BIOASTRONAUTICS
Soyuz-16: Biological experiments
[NASA-TT-F-16356] N75-24293
BIOCHEMISTRY
Standard reference materials: The role of SRM's in measurement systems --- in nuclear engineering and chemistry
[COM-75-50070/2] N75-23941
BIOELECTRIC POTENTIAL
Analysis of central nervous system involvement
[AD-A007581] N75-24345
BIOGENY
Several question of the phylogeny and system of lacertilia [seu sauria]
[NASA-TT-F-16354] N75-24295
BIOGRAPHY
Korolev: A chronicle --- a biography of Sergey Pavlovich Korolev
[NASA-TT-F-16278] N75-24654
BIOLOGICAL EFFECTS
Aerospace Medicine and Biology: A continuing bibliography with indexes, supplement 139
[NASA-SP-7011(139)] N75-24315
Biological experiments on Salyut-4
[NASA-TT-F-16267] N75-24321
Biologic effects and health hazards of microwave radiation
[PB-239554/9] N75-24352
BIOLOGICAL EVOLUTION
The innervation of chick striated muscle fibres by the chick ciliary ganglion in tissue culture
[MBL-1974-33] N75-24338
Jupiter and planet Earth --- planetary and biological evolution and natural satellites
[NASA-TM-X-66829] N75-24633
BIOLOGY
European scientific notes. Volume 29 number 3
[AD-A007612] N75-24535
BIOMEDICAL DATA
Health care and satellite radio communication in village Alaska
[PB-238742/1] N75-24343
BIONICS
SAAM25, simulation, modeling and data fitting program. User's guide --- FORTRAN and bionics
[PB-238368/5] N75-24400
BIOSYNTHESIS
Preferential release of newly synthesized acetylcholine by cortex slices from rat brain
[MBL-1974-34] N75-24339

BIRDS
Utilization of Skylab EREP system for appraising changes in continental migratory bird habitat --- using multispectral band scanner
[E75-10281] N75-24054
BISMUTH ALLOYS
Studies on immiscible alloys --- the processing of galium-bismuth in a low-gravity environment
[NASA-CR-120764] N75-23759
BISMUTH OXIDES
A study of the physical properties and bistable conduction characteristics of amorphous bismuth thioxide thin films
N75-24493
BISTATIC REFLECTIVITY
Bistatic radar sea state monitoring field test
[NASA-CR-141394] N75-23919
BLACK BODY RADIATION
Variation of solar-selective properties of black chrome with plating time
[NASA-TM-X-71731] N75-23753
BLACKOUT [PROPAGATION]
Laboratory and flight results of the microstrip plasma probe --- blackout [propagation] and plasma sheaths
[AD-A007685] N75-23947
BLOOD PLASMA
Effects of muscular exercise on variation in plasma cortisol and glucose in normal males
[NASA-TT-F-16257] N75-24326
BLUNT BODIES
Effect of nonequilibrium processes on the gas-dynamic parameters in hypersonic installations and in the critical point of a blunted body
[AD-A007414] N75-23904
BODIES OF REVOLUTION
Invariant dynamics of flight vehicles under rotating reference frames
[AD-A007671] N75-23642
Application of local linearization and the transonic equivalence rule to the flow about slender analytic bodies at Mach numbers near 1.0
[NASA-TM-X-72654] N75-23890
Computer analysis of multicircuit shells of revolution by the field method
[NASA-CR-2535] N75-24037
A finite element analysis of bodies of revolution. A comparison between currently used types of elements
[CRIF-MT-102] N75-24422
BOILERS
Where the boilers are: A survey of electric utility boilers with potential capacity for burning solid waste as fuel
[PB-239392/4] N75-24135
Conference proceedings, Steam Power Plant Workshop
[PB-239514/3] N75-24148
Solar energy for process steam generation
[PB-238109/3] N75-24154
Field testing: Application of combustion modifications to control pollutant emissions from industrial boilers, phase 1
[PB-238920/3] N75-24185
BOLTZMANN DISTRIBUTION
Nonlinear Couette flow problem in collisional plasmas --- using Boltzmann distribution and Poisson equation
N75-24475
BONDING
Aluminum ribbon and round wire bonding: Comparative analysis
[AD-A007513] N75-23777
Durability of adhesive bonded joints --- and surface preparation methods
[AD-A007873] N75-24010
BOOLEAN ALGEBRA
Fault detection through parallel processing in Boolean algebra
[AD-A007552] N75-24397
BOOSTER RECOVERY
Hydrodynamic stability evaluation of an 0.088-scale solid rocket booster model --- recovery by towing in various sea states
[AD-A007477] N75-23686
BOOSTER ROCKET ENGINES
Hydrodynamic stability evaluation of an 0.088-scale solid rocket booster model --- recovery by towing in various sea states
[AD-A007477] N75-23686
BORON
Anelastic deformation of boron fibers --- vapor deposited fibers
[NASA-TM-X-71710] N75-23697
BORON REINFORCED MATERIALS
Combined stress effects upon failure of fiber composites --- carbon fiber reinforced plastics and boron reinforced materials
[AD-A007352] N75-23716
BOROSILICATE GLASS
Glass-Si heterojunction solar cells
[PB-239282/7] N75-24156
BOUNDARY LAYER FLOW
Supersonic laminar boundary layer flow past a wavy wall with multiple separation regions
[AD-A007433] N75-23905
An experimental investigation of the boundary layer under pack ice
[AD-A007335] N75-24049
BOUNDARY LAYER TRANSITION
Drift current in a thin surface layer of the ocean
N75-24265
BOUNDARY LAYERS
Computational techniques for boundary layers
[SAND-74-5821] N75-24420
BOUNDARY LUBRICATION
The background to current theories of scuffing --- a study of boundary lubrication, sliding friction, and elastohydrodynamics
[S/T-MEMO-5/73] N75-23991
Elastohydrodynamic lubrication in line contact --- gears and film thickness
N75-23992
Lubrication breakdown under boundary conditions --- sliding friction and a failure analysis
N75-23993
BOUNDARY VALUE PROBLEMS
Application of internal analysis to problems of linear control systems --- boundary value problems and set theory
N75-24413
BRAGG ANGLE
Real-time wavefront correction through Bragg diffraction of light by sound waves
N75-24433
BRAIN DAMAGE
The cause of death resulting from transfusion resistant shock. Part 1: Influence of brain damage
[MBL-1975-1] N75-24330
BRAKES [FOR ARRESTING MOTION]
A unique concept for automatically controlling the braking action of wheeled vehicles during minimum distance stops
[NASA-TM-X-72665] N75-23987
BRAYTON CYCLE
Fluidized bed regenerators for Brayton cycles
[NASA-TM-X-71736] N75-23891
BRIDGES [STRUCTURES]
Fracture toughness of bridge steels, phase 2 report
[PB-239188/6] N75-23774
BRIGHTNESS
Optical observations of a few small H2 regions detected at infrared wavelengths --- density and brightness distribution
N75-24557
BRITTLENESS
The effect of grain size and retained austenite on the ductile-brittle transition of a titanium-gettered iron alloy
[AD-A007360] N75-23780
Strength degradation of brittle surfaces: Blunt indenters --- for ceramic materials
[AD-A007447] N75-23793
BROADBAND
A broadband digital diode phase shifter using a matrix interconnection of quadrature hybrid couplers, phase 1
[AD-A007294] N75-23864
BUBBLES
An experimental photographic investigation of vapor bubble collapse and liquid jet impingement
[PB-239019/3] N75-23909
BUCKLING
On an approximate yield criterion for thin steel shells
[PB-239166/2] N75-24040
BUILDINGS
Radiative heat transfer from products of combustion in building corridor fires
[COM-75-10209] N75-23742
BUOYS
Long-distance recording of the humidity over the sea
N75-24278
BUREAUS [ORGANIZATIONS]
Report on the Federal research and development program, fiscal year 1976
[PB-239528/3] N75-24527
BURNING RATE
Flame spreading on horizontal and vertical fuel surfaces --- flame propagation fuel flow burning rate and surface energy of thermoplastic resins
N75-23723

C

CADMIUM
Thermal neutron filter cadmium electroplate properties
[ANCR-1189] N75-23711
CADMIUM COMPOUNDS
Research on cadmium stannate selective optical films for solar energy applications
[PB-239372/6] N75-24159
CALCIUM FLUORIDES
Casting of halide and flouride alloys for laser windows
[AD-A007656] N75-24468
CALIFORNIA
Relative dispersion within the Los Angeles Basin as estimated from Tetroon triads
[COM-75-10197/2] N75-24181
Analysis of the composition of the atmosphere in the Los Angeles Basin
[PB-239466/6] N75-24199
CAMBERED WINGS
Studies and research on marine hulls working with natural ground effect
N75-23475
CAMERAS
Solid state camera
[MB/MC-GD-2036/73] N75-23917
Radiometric performance of the Viking Mars lander cameras
[NASA-TM-X-72692] N75-23921
Design study for a sensor utilizing an electrostatic camera. Volume 2: Appendices
[AD-A007070] N75-23940
CANADA
Towards a Canadian policy on remote sensing from space, a special report to the Canadian Advisory Committee on Remote Sensing
[PB-238846/0] N75-24075
The Canadian Advisory Committee on Remote Sensing, 1973 report
[PB-238848/6] N75-24076
CANARD CONFIGURATIONS
Effect of wing planform and canard location and geometry on the longitudinal aerodynamic characteristics of a close-coupled canard wing model at subsonic speeds
[NASA-TN-D-7910] N75-23514
An experimental investigation of the aerodynamic characteristics of several nose mounted canard configurations at supersonic Mach numbers
[AD-A007793] N75-23526
Effect of canard position and wing leading-edge flap deflection on wing buffet at transonic speeds
[NASA-TM-X-72681] N75-23559
CANTILEVER PLATES
Vibration analysis of skewed cantilever systems: Helicoidal shells and plates
N75-24026
CAPACITORS
An investigation of the theoretical limitations of a converter capacitor circuit during the charging and storage phases
N75-23845
Investigation of new dielectrics for miniaturized high-performance capacitors
[NASA-TT-F-16383] N75-24506
CAPILLARY FLOW
Acquisition system environmental effects study --- for capillary-screen propellant retention devices
[NASA-CR-120768] N75-23684
CARBON
Engineering and cost study of air pollution control for the petrochemical industry. Volume 1: Carbon black manufacture by the furnace process
[PB-238324/8] N75-24189
Radio recombination lines from carbon and heavier elements from the direction of NGC 2024
N75-24572
CARBON COMPOUNDS
Graphite fluoride lubrication: The effect of fluorine content, atmosphere, and burnishing technique
[NASA-TM-X-71733] N75-23988
CARBON DIOXIDE
Viking entry vehicle aerodynamics at m equals 2 in air and some preliminary test data for flight in CO2
[NASA-TN-D-7974] N75-23515
Pressures and elevations from CO2 band intensities based on measurements made on board the Mars-5 automatic interplanetary station [preliminary results]
[NASA-TT-F-16346] N75-23671
CARBON DIOXIDE LASERS
Study and application of pulsed CO2 lasers --- noting excitation by electric discharges and electron beam
N75-23808
The generation of step-tunable far infrared radiation by phase matched difference frequency mixing in planar dielectric waveguides
N75-23963
Modelocked, multiline pulsed CO2 oscillator
[LA-5839-MS] N75-23971
Carbon dioxide laser development and asymmetry in laser driven implosions
[LA-UR-74-1883] N75-23972
Infra-Red lasers and infra-red spectra of free radicals
[AD-A007720] N75-23978
Development of optical coatings for high-intensity laser applications
[AD-A007692] N75-24470
CARBON FIBER REINFORCED PLASTICS
The use of carbon fibre reinforced plastics in satellite structures. Volume 1: Summary
[HSD-TP-7509-VOL-1-SUMM] N75-23713
Combined stress effects upon failure of fiber composites --- carbon fiber reinforced plastics and boron reinforced materials
[AD-A007352] N75-23716

Material characterization of the fracture of filament, reinforced composites --- including carbon and glass fiber reinforced plastics
[AD-A007386] N75-23717
Third body formation and elimination on carbon fiber epoxy composite --- effects on friction and wear
N75-24004

CARBON FIBERS
Mechanical properties of aluminum alloy-graphite fiber composites --- metal matrix composites
[AD-A007779] N75-23715

CARBON MONOXIDE
Transmissivity of carbon monoxide in the 2.3 microns band region
[NASA-CR-142869] N75-23726
Carbon monoxide mapping of 100 micrometer sources associated with dark clouds: Preliminary results
N75-24582

CARDIOLOGY
Problems of space biology. Volume 26: Statistical analysis of the cardiac rhythm and hemodynamic indices in physiological research
[NASA-TT-F-16196] N75-24324

CARGO
Flight test for the feasibility evaluation of the Chadwick Electronic Weighing System [CHEWS]
[AD-A007516] N75-23522

CARIBBEAN SEA
Summary of synoptic meteorological observations Caribbean and nearby island coastal marine areas. Volume 2: Area 7 - Cayman, area 8 - Jamaica west, area 9 - Jamaica south, area 10 - Jamaica north, area 11 - Jamaica south-east
[AD-A001031] N75-24235
Summary of synoptic meteorological observations Caribbean and near by Island coastal marine areas. Volume 4: Areas 18 - Hispaniola north, area 19 - Santo Domingo, area 20 - Mona Passage, area 21 - Puerto Rico south, area 22 - Puerto Rico north, area 23 - Vieques
[AD-A001457] N75-24236
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 3: Area 12, Hispaniola South; area 13, Windward Passage; area 14, Grand Bahama; area 15, Nassau; area 16, San Salvador; area 17, Acklins Island
[AD-A001912] N75-24244
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 5: Area 24, Virgin Islands; area 25, Leeward Islands; area 26, Winward Islands; area 27, Trinidad; area 28, Barcelona; area 29, Caracas
[AD-A001918] N75-24245
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 6: Area 30, Gulf of Venezuela, area 31, Riohacha; area 32, Cartagena; area 33, Colon; area 34, Gulf of Panama; area 35, Galapagos islands
[AD-A001973] N75-24246

CARRIER INJECTION
Functioning of power rectifiers and thyristors from 1 January 1970 to 31 December 1972, noting carrier injection, emitter shorts, ignition, and breakdown
[NASA-TT-F-16365] N75-23850

CARRIER WAVES
Radiation of electromagnetic walsh, waves, part 2 --- pulse communication
[AD-A007067] N75-23825

CASCADE FLOW
Nonstationary aerodynamics of arbitrary cascades in compressible flow
N75-23474

CASSEGRAIN OPTICS
A systematic study of aplanatic two-mirror telescopes with application to the large spare telescope
N75-23914

CATALOGS [PUBLICATIONS]
Catalog of selected NMAB reports
[AD-A007358] N75-24534

CATECHOLAMINE
Catecholamine excretion from air cadets --- adrenal gland response
N75-24303

CATIONS
Research for preparation of cation-conducting solids by high-pressure synthesis and other methods
[NASA-CR-134836] N75-24504

CAUCHY PROBLEM
On the generalization of Kirchhoff formula
[NASA-TT-F-16332] N75-24430

CAVITATION FLOW
Cavitation inception thresholds in water and nuclei spectra by light scattering technique
[PB-238448/5] N75-23895
Experimental study of model size effects on cavitation and ventilation of surface piercing struts --- hydrofoil craft
[AD-A006672] N75-23896
Comparison of two nucleus spectrum measuring devices and the influence of several variables on cavitation threshold in water
N75-23915

CAVITIES
Stress concentration in an expanded plate with opening reinforced by central belt
[AD-A007672] N75-24044

CDC COMPUTERS
Study of the modifications needed for efficient operation of NASTRAN on the Control Data Corporation STAR-100 computer
[NASA-CR-132644] N75-24382
Brooknet: A high speed computer network --- data transmission
[BNL-19365] N75-24409

CDC 6600 COMPUTER
TACOS 2 documentation. Volume 3D: TERAIN, PMAP, SORTEV user/planner manual --- for antimissile and antiaircraft defense systems
[AD-782158] N75-24396

CENTAUR LAUNCH VEHICLE
Centaur Standard Shroud [CSS] static limit load structural tests
[NASA-TM-X-71727] N75-23669

CENTRAL NERVOUS SYSTEM
Analysis of central nervous system involvement
[AD-A007581] N75-24345

CERAMIC COATINGS
Survey of coatings for solar collectors --- ceramic enamels and chromium
[NASA-TM-X-71730] N75-23989

CERAMICS
Strength degradation of brittle surfaces: Blunt indenters --- for ceramic materials
[AD-A007447] N75-23793
Selected contributions to high-speed physics --- covering mechanical-electrical energy conversion in ferroelectric ceramics, and mode locked pulsed lasers
[BMVG-FBWT-74-8] N75-23804
Nonlinear conversion of ferroelectric energy and energy conversion by forced transition with Pb[Zr sub [1-x]Ti sub x]O3 ceramics
N75-23805
Thermoelectric properties of ceramic refractory semiconductors
[AD-A007862] N75-24519
Research lab at Turda Electroceramica Plant described
N75-24661

CEREBRAL CORTEX
Preferential release of newly synthesized acetylcholine by cortex slices from rat brain
[MBL-1974-34] N75-24339

CERIUM COMPOUNDS
Neutron scattering and magnetization measurements on the Kondo compound CeAl3
[CONF-741202-13] N75-24450

CESIUM
Variations in the work function of [100]W by the adsorption of oxygen, the adsorption of cesium and the coadsorption of oxygen and cesium
[NASA-TT-F-16364] N75-23725

CHANNEL FLOW
One class of the exact solutions of the equations of Navier-stokes for unsteady flow of the compressible gas in channels
[AD-A007402] N75-23903
Exact solutions of the equations of Navier-Stokes for the flow of the compressible gas in channels
[AD-A007683] N75-23908
Hydraulic and flow studies related to sediment transport, Kentucky River, Kentucky
[PB-239259/5] N75-24092

CHANNELS [DATA TRANSMISSION]
Design of a digital voice data compression technique for orbiter voice channels
[NASA-CR-141790] N75-23820
A fast-initializing digital equalizer with on-line tracking for data communications
N75-23843
The space bandwidth produce of multi-channel coherent processes
[AD-A007775] N75-23955

CHARACTERIZATION
Characterization of implanted silicon by Raman and infrared spectrocopy
N75-24013

CHARCOAL
The dynamics of adsorption of vapours by porous adsorbents in fixed beds. [Breakthrough curves of sarin on charcoal in the very low concentration region]
[TDCK-65300] N75-24167
Non-destructive test of charcoal filters. Part 3: Characteristics of the elution peaks of ethane and propane on partially spent charcoal filters of various moisture contents
[TDCK-65348] N75-24168

CHARGE DISTRIBUTION
The charge ratio of ultra high energy cosmic ray muons
N75-24649

CHARGED PARTICLES
Ionization in the track of a high-energy electron in hydrocarbon liquids. Study of positive and negative ion scavenging using nanosecond pulse radiolysis
[IRI-133-74-06] N75-24455
Interplanetary charged particle models [1974] --- and the effects of cosmic exposure upon spacecraft and spacecraft components
[NASA-SP-8118] N75-24607

CHECKOUT
Automatic program verification 3: A methodology for verifying programs --- proving and checkout
[AD-A007563] N75-24398

CHEMICAL ANALYSIS
Chemistry of organic sulfur compounds contained in petroleums and petroleum products, Volume 7
[TT-70-57759] N75-23691

CHEMICAL BONDS
A chemical bond approach to metals and alloys
N75-23744

CHEMICAL ENGINEERING
Automation trends --- technology utilization of digital computers for production planning in chemical engineering
[UCRL-75320] N75-23728

CHEMICAL LASERS
Probes for density measurements of F2, HF, and DF in continuously operating chemical lasers
[SAND-74-0432] N75-23970
HF/DF chemical laser performance modification by chemical additives --- supersonic flow
[AD-A007263] N75-23976

CHEMICAL PROPERTIES
Correlation of materials properties with the atomic density concept
[NASA-CR-120751] N75-23727

CHEMICAL REACTIONS
Conversion of cattle feedlot wastes to ammonia synthesis gas
[PB-239668/7] N75-23692
Study of the reaction of atomic oxygen with aerosols
[NASA-CR-2529] N75-24441

CHEMISORPTION
Investigation of hydrogen chemisorption on the tungsten [100] surface --- Auger spectroscopy
[AD-A007434] N75-23731

CHEMISTRY
European scientific notes. Volume 29 number 3
[AD-A007612] N75-24535

CHICKENS
The innervation of chick striated muscle fibres by the chick ciliary ganglion in tissue culture
[MBL-1974-33] N75-24338

CHLORATES
System evaluation of solid chemical oxygen generators --- using sodium chlorate candles
[AD-A007691] N75-23690

CHLORINE
Reaction rates and energy distributions among reaction products for the H plus Cl2 and Cl plus H2 reactions
[AD-A007782] N75-23735

CHOLINE
Preferential release of newly synthesized acetylcholine by cortex slices from rat brain
[MBL-1974-34] N75-24339

CHOLINESTERASE
Reactivating potency of some oximes towards phosphylated acetylcholinesterase
[TDCK-65518] N75-24310

CHROMIUM
Survey of coatings for solar collectors --- ceramic enamels and chromium
[NASA-TM-X-71730] N75-23989

CHROMIUM ALLOYS
Preparation and properties of tungsten-wire reinforced NiCr 80-20
[NASA-TT-F-16275] N75-23696

CHROMIUM COMPOUNDS
Variation of solar-selective properties of black chrome with plating time
[NASA-TM-X-71731] N75-23753

CIRCUIT DIAGRAMS
The design of multiple-valued asynchronous sequential circuits
N75-23846

CIRCUIT PROTECTION
FAA lightning protection study: Lightning protection requirements for Wilcox mark 1/A instrument landing system
[AD-A008934] N75-23545

CIRCUITS
A testability measure for register-transfer level digital circuits
N75-23844
Computer analysis of multicircuit shells of revolution by the field method
[NASA-CR-2535] N75-24037

CIRCULAR CYLINDERS
Flow of a particulate suspension in the wake of a circular cylinder
N75-23471
Application of complex ray tracing to the scattering of an evanescent plane wave by a conducting circular cylinder
N75-24429

CIRCULAR ORBITS
Minimum-time rescue trajectories between spacecraft in circular orbits
N75-23628
CIRCULAR SHELLS
Numerical solution of the axisymmetric tasks of creep of circular cylindrical shells --- bending moments
[AD-A007476] N75-24042
CIRCULAR TUBES
Laminar flow heat transfer in ordinary and augmented tubes
N75-23879
CITIES
Urban environmental health applications of remote sensing
[NASA-CR-141796] N75-24522
CIVIL AVIATION
Saint Louis aviation forecast study: Technical supplement --- ground access analysis data
[PB-239058/1] N75-23535
Saint Louis aviation forecast study: Review of prior forecasts
[PB-239057/3] N75-23536
Saint Louis aviation forecast study
[PB-239056/5] N75-23537
Saint Louis aviation forecast study: Executive summary
[PB-239055/7] N75-23538
Civil aviation studies and interagency coordinating organizations, volume 1 --- aircraft noise reduction
[PB-239344/5] N75-24186
Civil aviation studies and interagency coordinating organizations, volume 2: Appendices --- aircraft noise reduction
[PB-239345/2] N75-24187
CLIMATOLOGY
Operations of the National Weather Service, 1974
[COM-75-10194/9] N75-24239
Physical nature of the climatic and biological effects of the Peru current
N75-24279
CLINICAL MEDICINE
Standardization of objective medico-psychiatric questionnaire in the French Army
N75-24307
A multi-disciplinary team for the treatment of patients with defect upper extremities: A need for optimal rehabilitation
[WTHD-67] N75-24325
CLOUD CHAMBERS
Cloud physics: Experimental investigations
[TT-73-50032] N75-24250
A cloud-chamber search for multiple-cores and high transverse-momenta in cosmic ray air showers --- particle density [concentration]
N75-24650
CLOUD PHYSICS
Cloud physics: Experimental investigations
[TT-73-50032] N75-24250
Collected reprints: 1971-1972: Atmospheric physics and chemistry laboratory --- considering weather modification
[COM-75-10260/8] N75-24258
Zero-gravity atmospheric Cloud Physics Experiment Laboratory; Programmatics report
[NASA-CR-120725] N75-24526
CLOUDS [METEOROLOGY]
Cloud motion in relation to the ambient wind field
[NASA-CR-2557] N75-24233
Cloud physics: Experimental investigations
[TT-73-50032] N75-24250
CLUTCHES
Advanced overrunning clutch technology, design phase
[AD-A007815] N75-23562
COAL
The direct production of hydrocarbons from coal-steam systems
[PB-239356/9] N75-23740
An asymptotic ignition theory of porous solid fuels [thermo-diffusive theory] --- differential equations for the ignition of coal
N75-23798
Electromagnetic noise in McElroy Mine
[COM-74-11717/7] N75-23826
Design optimization in underground coal systems
[PB-239075/5] N75-24153
COAL GASIFICATION
Coal processing by electrofluidics
[PB-238973/2] N75-23741
Low-temperature evolution of hydrocarbon gases from coal
[PB-238322/2] N75-24074
Hydrogen production from coal
[NASA-CR-142816] N75-24113
Demonstration plant, clean boiler fuels from coal. Volume 3: Preliminary design/economics analysis
[PB-238529/2] N75-24127
Technology and use of lignite
[PB-238666/2] N75-24131
Symposium proceedings: Environmental Aspects of Fuel Conversion Technology
[PB-238304/0] N75-24179
COAL LIQUEFACTION
Low-temperature evolution of hydrocarbon gases from coal
[PB-238322/2] N75-24074
Demonstration plant, clean boiler fuels from coal. Volume 3: Preliminary design/economics analysis
[PB-238529/2] N75-24127
Technology and use of lignite
[PB-238666/2] N75-24131
Symposium proceedings: Environmental Aspects of Fuel Conversion Technology
[PB-238304/0] N75-24179
COAL UTILIZATION
Real-time characterization of particles emitted by coal-fired power generating plant --- air pollution control
N75-24160
COASTS
Proceedings from the Gulf States Conference on Coastal Zone Management
[COM-75-10201/2] N75-24081
Field studies and remote sensing along the Natal Coast, South Africa
[AD-A007285] N75-24084
An operational framework for coastal zone management planning
[PB-239519/2] N75-24090
Summary of synoptic meteorological observations Caribbean and nearby island coastal marine areas. Volume 2: Area 7 - Cayman, area 8 - Jamaica west, area 9 - Jamaica south, area 10 - Jamaica north, area 11 - Jamaica south-east
[AD-A001031] N75-24235
Summary of synoptic meteorological observations Caribbean and near by island coastal marine areas. Volume 4: Areas 18 - Hispaniola north, area 19 - Santo Domingo, area 20 - Mona Passage, area 21 - Puerto Rico south, area 22 - Puerto Rico north, area 23 - Vieques
[AD-A001457] N75-24236
Summary of synoptic meteorological observations. North American coastal marine areas, revised. Atlantic and Gulf Coasts. Volume 1. Revised. Area 1: Belle Isle Strait. Area 2: Osv Bravo. Area 3: NE Newfoundland coast. Area 4: SE Newfoundland coast. Area 5: Placentia Bay south. Area 6: Cabot Strait. Area 7: Anticosti Island
[AD-A006990] N75-24237
Summary of synoptic meteorological observations. Indonesian coastal marine areas, volume 1. Area 1: Southeast Sumatra. Area 2: Christmas Island. Area 3: Sunda Strait. Area 4: Northeast Java Sea. Area 5: Bangka Island northeast. Area 6: Natuna Island. Area 7: Sarawak
[AD-A006923] N75-24242
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 3: Area 12, Hispaniola South; area 13, Windward Passage; area 14, Grand Bahama; area 15, Nassau; area 16, San Salvador; area 17, Acklins Island
[AD-A001912] N75-24244
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 5: Area 24, Virgin Islands; area 25, Leeward Islands; area 26, Winward Islands; area 27, Trinidad; area 28, Barcelona; area 29, Caracas
[AD-A001918] N75-24245
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 6: Area 30, Gulf of Venezuela, area 31, Riohacha; area 32, Cartagena; area 33, Colon; area 34, Gulf of Panama; area 35, Galapagos islands
[AD-A001973] N75-24246
COAXIAL FLOW
Thrust/drag analysis for a front fan nacelle having two separate co-axial exhaust streams
[ARC-CP-1311] N75-23574
COBALT
Water hyacinths and alligator weeds for removal of silver, cobalt, and strontium from polluted waters
[NASA-TM-X-72727] N75-24163
COBALT ALLOYS
Surface studies of cobalt alloys in ultra high vacuum utilizing contact resistance
N75-23745
Magnetic properties of neodymium-samarium-cobalt alloys
[AD-A007848] N75-24520
COBOL
COBOL compiler validation system [1974] [X3.23-1974] ANS COBOL 1974. Interprogram communication module test specifications --- including editing routines
[AD-A002975] N75-24375
COBOL compiler validation system [1974] [X3.23-1974] ANS COBOL 1974. Sequential I-O module test specifications
[AD-A002973] N75-24395
COCKPITS
CF5D aircraft cockpit-noise reduction
[DCIEM-74-R-1048] N75-23564
CODERS
A technique for determining the accuracy of an incremental shaft encoder --- phased locked systems
[AD-A007781] N75-23945
CODING
Source encoding for orbiter communications links
[NASA-CR-141792] N75-23653
Correlation modulation --- data correlation
[AD-A007338] N75-23837
COHERENCE COEFFICIENT
The distribution of jet source strength intensity by means of a direct correlation technique --- far and near fields
N75-23872
COHERENT SCATTERING
A 1964 digital data base for ionospheric modeling. Part B: Incoherent scatter radar results
[COM-75-10199/8] N75-23827
COLD HARDENING
Undercooling of materials during solidification in space
[NASA-CR-120750] N75-23624
COLLAPSE
An experimental photographic investigation of vapor bubble collapse and liquid jet impingement
[PB-239019/3] N75-23909
COLLIMATORS
Radiative transfer between surfaces with spectral, directional, and temperature dependent properties --- radiative heat transfer of tungsten by collimated solar flux
N75-23873
Acoustic lens design
[AD-A007847] N75-24435
COLLISION PARAMETERS
Microwave transient response measurements of elastic momentum transfer collision frequency
[ORO-3027-26] N75-24444
COLLISIONAL PLASMAS
Frequency mixing of electromagnetic waves in plasmas by collisional processes
N75-24473
Nonlinear Couette flow problem in collisional plasmas --- using Boltzmann distribution and Poisson equation
N75-24475
COLLISIONLESS PLASMAS
Electron plasma oscillations in a static electric field
[TRITA-EPP-74-21] N75-24484
COLOR
Man-machine communications: An examination of the machines
N75-24371
COLOR TELEVISION
Specification of the timing stabilities of broadcast monochrome and PAL colour television signals
[BBC-RD-1975/14] N75-23818
COLOR VISION
Predictive validities of several clinical color vision tests for aviation signal light gun performance
[AD-A606792] N75-24317
On rod visual acuity and cone visual acuity --- color vision and light adaptation
[NASA-TT-F-16315] N75-24323
COLORIMETRY
A method for determining oil in water
[AD-A007871] N75-23734
COMBINATORIAL ANALYSIS
Use of macros in backtrack programming
[PB-238644/9] N75-24386
COMBUSTION
Smoke hazards from burning plastics
[UCRL-76015] N75-23809
Lubricating oil burn-off in Coast Guard power plants
[AD-A007313] N75-23811
COMBUSTION CHAMBERS
Heat recovery systems for industrial furnaces, particularly coke ovens
[NASA-TT-F-16400] N75-23889
Transient operation of a steady state burner --- continuous flow combustion for low pollution automobile engines
N75-24095
COMBUSTION CONTROL
A digital controller applied to the limitation of reheat combustion roughness
N75-23586
COMBUSTION EFFICIENCY
An analysis of droplet size distribution during monopropellant spray combustion
N75-23799
COMBUSTION PHYSICS
Problems in combustion and extinguishment --- flame propagation
[TT-71-58001] N75-23737
COMBUSTION PRODUCTS
Radiative heat transfer from products of combustion in building corridor fires
[COM-75-10209] N75-23742
Transient operation of a steady state burner --- continuous flow combustion for low pollution automobile engines
N75-24095
Real-time characterization of particles emitted by coal-fired power generating plant --- air pollution control
N75-24160

Assessment of possible environmental effects of space shuttle operations
[NASA-CR-129003] N75-24162

COMETS
Infrared spectroscopy of Comet Kohoutek --- and reflection studies of frost spectra
[NASA-CR-142809] N75-24597

COMMAND AND CONTROL
Possible improvements to HF devices derived from irradiative control of the diffusion processes
[DTCE/3096] N75-24499

COMMERCIAL AIRCRAFT
Passenger demographics and subjective response to commuter aircraft in the northeast
[NASA-CR-142876] N75-23532

COMMUNICATION
A fast-initializing digital equalizer with on-line tracking for data communications
N75-23843

COMMUNICATION SATELLITES
A preliminary design of a TDMA system for FLEETSAT
[AD-A007823] N75-23829
Grease lubricated spiral groove bearings for long-life systems --- communication satellite momentum wheel
N75-24003

COMMUNICATION THEORY
Tactical communication systems --- signal processing and switching theory
[AD-A007260] N75-23833

COMMUNICATIONS TECHNOLOGY SATELLITE
Communications experimenter's guide. Communications technology satellite
[CRC-TN-671[CS-03-01]] N75-23655
A structural dynamics model for flexible solar arrays of the communications technology satellite
[CRC-1268] N75-24034

COMMUNITIES
Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety
[PB-239429/4] N75-24351

COMMUTATORS
Elements of address and adaptive radio telemetry systems, chapter 8
N75-23822

COMPARATOR CIRCUITS
Lower bounds on merging networks
[PB-238554/0] N75-23855

COMPILERS
COBOL compiler validation system [1974] [X3.23-1974] ANS COBOL 1974. Interprogram communication module test specifications --- including editing routines
[AD-A002975] N75-24375
COBOL compiler validation system [1974] [X3.23-1974] ANS COBOL 1974. Sequential I-O module test specifications
[AD-A002973] N75-24395

COMPONENT RELIABILITY
The effect of sunshine testing on terrestrial solar cell system components
[NASA-TM-X-71722] N75-24109

COMPOSITE MATERIALS
Specialists meeting on Failure Modes of Composite Materials with Organic Matrices and Their Consequences on Design
[AGARD-CP-163] N75-23698
Prediction of static and fatigue damage and crack propagation in composite materials
N75-23699
Failure criteria to fracture mode analysis of composite laminates
N75-23700
An experimental study to determine failure envelope of composite materials with tubular specimens under combined loads and comparison between several classical criteria
N75-23701
Inelastic behaviour of composites [plastic prediction by limit analysis]
N75-23702
Practical finite element method of failure prediction for composite material structures
N75-23703
Stress and strength analysis of reinforced plastic with holes. Consequences on design
N75-23705
Fracture behaviour and residual strength of carbon fibre composites subjected to impact loads
N75-23706
Optical methods for testing composite materials --- stress analysis and fracture mechanics
N75-23707
Design of composite structure with respect to avoid crack propagation
N75-23709
Consideration of failure modes in the design of composite structures
N75-23710
Determination of thermal properties of layer composites by flash method
[PB-239114/2] N75-23718
Composite self lubricating materials for space applications
N75-24005

COMPOSITE PROPELLANTS
Non-linear fracture mechanics: New theories of solid propellant response and fracture behaviors
[AD-A007334] N75-23800

COMPOSITE STRUCTURES
Thermal loading in the laser holography nondestructive testing of a composite structure
[NASA-TR-R-439] N75-24035

COMPRESSIBLE FLOW
Nonstationary aerodynamics of arbitrary cascades in compressible flow
N75-23474
One class of the exact solutions of the equations of Navier-stokes for unsteady flow of the compressible gas in channels
[AD-A007402] N75-23903
Exact solutions of the equations of Navier-Stokes for the flow of the compressible gas in channels
[AD-A007683] N75-23908

COMPRESSOR EFFICIENCY
A compressor designed for the energy research and development agency automotive gas turbine program
[NASA-TM-X-71719] N75-24116

COMPUTER DESIGN
An asynchronous logic array
[PB-238681/1] N75-24374
Romanian computers and office equipment described
N75-24660

COMPUTER GRAPHICS
Use of interactive computer graphics in water resources planning and management
[PB-238631/6] N75-24079

COMPUTER PROGRAMMING
Remote-terminal emulator [design verification model]: Introduction and summary
[AD-A007827] N75-24376
Use of macros in backtrack programming
[PB-238644/9] N75-24386
Engineering of quality software systems [some case studies in structured programming]
[AD-A007771] N75-24392
Parameter identification in distributed systems using a digital simulation language: Using extension of PDEL
[PB-239431/0] N75-24404
Solution of simultaneous partial differential equations: An extension of PDEL
[PB-239432/8] N75-24405
READY 1 system for the UNIVAC 1108 attack conditions program
[PB-239295/9] N75-24668

COMPUTER PROGRAMS
FORTRAN program for calculating the trajectory of projectiles
[NASA-TT-F-16316] N75-23634
Study to document low thrust trajectory optimization programs HILTOP and ASTOP
[NASA-CR-120767] N75-23635
TIMAVI: A computer program to time-average repetitively scanned digitized spectra --- nuclear magnetic resonance
[AD-A007849] N75-23733
Computing programme for a two sublattice neel ferrimagnet, application to the rareearth compounds
[IFA-SR-9-1974] N75-23770
Elements of address and adaptive radio telemetry systems, chapter 8
N75-23822
KACHINA: An eulerian computer program for multifield fluid flows
[LA-5680] N75-23893
Development of a nonpenetrating inductance probe for measuring lubricating film thickness in a dynamic seal --- using computer programs
N75-23912
A computer code for time dependent recombination lasers --- to solve population inversion problems
[AD-A007292] N75-23975
Computer analysis of multicircuit shells of revolution by the field method
[NASA-CR-2535] N75-24037
CGR: An improved computerized model to predict fatigue crack growth under spectrum loading
[AD-A007481] N75-24043
Path to self-sufficiency directions and constraints, appendices --- a computer program that calculates energy resource requirements
[PB-239100/1] N75-24155
Changes in visual evoked response by non-visual task processing --- computer programs
N75-24301
Algebraic techniques for the analysis and design of digital filters --- computer-aided design program
N75-24370
Efficient simulation of a computer system --- for digital UNIVAC computers
N75-24381
Engineering of quality software systems
[AD-A007766] N75-24387
Engineering of quality software systems [effects of management philosophy on software production]
[AD-A007767] N75-24388
Engineering of quality software systems [software first concepts]
[AD-A007768] N75-24389
Engineering of quality software systems [towards an analysis of the LISP programming language]
[AD-A007769] N75-24390
Engineering of quality software systems [measuring the complexity of computer software]
[AD-A007770] N75-24391
Engineering of quality software systems [some case studies in structured programming]
[AD-A007771] N75-24392
Engineering of quality software systems [a software error classification methodology]
[AD-A007772] N75-24393
Engineering of quality software systems [software reliability modeling and measurement techniques]
[AD-A007773] N75-24394
TACOS 2 documentation. Volume 3D: TERAIN, PMAP, SORTEV user/planner manual --- for antimissile and antiaircraft defense systems
[AD-782158] N75-24396
Automatic program verification 3: A methodology for verifying programs --- proving and checkout
[AD-A007563] N75-24398
SAAM25, simulation, modeling and data fitting program. User's guide --- FORTRAN and bionics
[PB-238368/5] N75-24400
NOR network transduction procedures: Merging of gates and substitution of gates for fan-in and fan-out restricted networks [NETTRA-G3-FIFO and NETTRA-PG1-FIFO]
[PB-238944/3] N75-24401
APS-73 cross assembler reference manual --- symbolic programming
[PB-238821/3] N75-24403
A generalized inversion program --- integral equations and iterative solution
[COM-75-50159/3] N75-24406
Pulse Doppler ambiguity resolution --- basic programming language
[AD-A007416] N75-24415
Optimal Synthesis Program for Automatic Control [OSPAC] --- in FORTRAN
[AD-A007550] N75-24416
Slope stability analysis: A computerized solution of Bishop's simplified method of slices
[PB-238954/2] N75-24548
READY 1 system for the UNIVAC 1108 weapons effect program
[PB-239293/4] N75-24666

COMPUTER SYSTEMS DESIGN
Remote-terminal emulator [design verification model]: Introduction and summary
[AD-A007827] N75-24376
Engineering of quality software systems
[AD-A007766] N75-24387
Engineering of quality software systems [software first concepts]
[AD-A007768] N75-24389

COMPUTER SYSTEMS PROGRAMS
Engineering of quality software systems
[AD-A007766] N75-24387
Engineering of quality software systems [effects of management philosophy on software production]
[AD-A007767] N75-24388
Engineering of quality software systems [software first concepts]
[AD-A007768] N75-24389
Engineering of quality software systems [towards an analysis of the LISP programming language]
[AD-A007769] N75-24390
Engineering of quality software systems [measuring the complexity of computer software]
[AD-A007770] N75-24391
Engineering of quality software systems [some case studies in structured programming]
[AD-A007771] N75-24392
Engineering of quality software systems [a software error classification methodology]
[AD-A007772] N75-24393
Engineering of quality software systems [software reliability modeling and measurement techniques]
[AD-A007773] N75-24394
Deadlock in distributed computer networks --- multiprogramming and resource allocation
[PB-238943/5] N75-24412

COMPUTER TECHNIQUES
The role of computers in future propulsion controls
N75-23582
A digital controller applied to the limitation of reheat combustion roughness
N75-23586
Calculations of laser induced spall in aluminum targets
[LA-5619-MS-REV] N75-23968
Study of USGS/NASA land use classification system --- computer analysis from LANDSAT data
[NASA-CR-120763] N75-24069
Computer measurement of complex performance --- on digital computers
N75-24300

Some fast analytical techniques for the EEG --- using probability distribution function and hybrid computers
N75-24305
COBOL compiler validation system [1974] [X3.23-1974] ANS COBOL 1974. Interprogram communication module test specifications --- including editing routines
[AD-A002975] N75-24375
Microprocessors in computing --- floating point arithmetic
[UCRL-76234] N75-24385
Description of computer network analysis model --- used computerized simulation
[AD-A007417] N75-24410
Applied systems ecology: Models, data, and statistical methods
[BNWL-SA-5216] N75-24425
Regional environmental analysis and management: New techniques for current problems
[NASA-TM-X-66813] N75-24546
Translations on eastern Europe: Scientific affairs, no. 464 --- metal working, theoretical physics, computer techniques
[JPRS-64751] N75-24655
Setup of administrative computer service described
N75-24659
Romanian computers and office equipment described
N75-24660

COMPUTERIZED DESIGN
Computer-augmented design of aircraft wing structures
N75-23554
Algebraic techniques for the analysis and design of digital filters --- computer-aided design program
N75-24370

COMPUTERIZED SIMULATION
Simulation techniques for turbomachines
N75-23591
Generalized dynamic engine simulation techniques for the digital computers
N75-23593
Total powerplant simulation
N75-23594
Use of simulation in the design, development and testing of power plant control systems
N75-23595
Practical stability of a reluctance synchronous machine
[AD-A007659] N75-23605
Nonequilibrium radiation model for exhaust plumes
[AD-A007795] N75-23687
Efficient simulation of a computer system --- for digital UNIVAC computers
N75-24381
SAAM25, simulation, modeling and data fitting program. User's guide --- FORTRAN and bionics
[PB-238368/5] N75-24400
Description of computer network analysis model --- used computerized simulation
[AD-A007417] N75-24410
Guiding center simulation of toroidal plasmas
[UCRL-51725] N75-24480

COMPUTERS
Application of computer controlled monitoring and data reduction to potentiometry and voltammetry
N75-24380

CONCORDE AIRCRAFT
Reverse thrust experience on the concorde
N75-23496
Sound and vibration measurements for Concorde supersonic transport and subsonic jet aircraft
[PB-238748/8] N75-24436

CONCRETES
Field evaluation of void spacing indicator --- reliability control of concrete pavements
[PB-239044/1] N75-24019

CONDUCTION ELECTRONS
Image-storage tube for space applications. Development of the SEC target --- methods to assess target resolution, target stabilization
[ESRO-CR-212] N75-23938

CONFERENCES
Electric power for space satellites
[NASA-TM-X 66808] N75-23678
Specialists meeting on Failure Modes of Composite Materials with Organic Matrices and Their Consequences on Design
[AGARD-CP-163] N75-23698
Proceedings from the Gulf States Conference on Coastal Zone Management
[COM-75-10201/2] N75-24081
Technology and use of lignite
[PB-238666/2] N75-24131
Proceedings of 5th annual symposium: Energy Research and Development --- solar energy, windpower utilization, thermonuclear power generation
[AD-A007799] N75-24142
Proceedings of the Solar Thermal Conversion Workshop
[PB-239277/7] N75-24157
Marine pollution monitoring [petroleum]: Proceedings of a Symposium and Workshop held at the National Bureau of Standards
[COM-75-50071/0] N75-24183
Medical requirements and examination procedures in relation to the tasks of today's aircrew: Comparison of examination techniques in neurology, psychiatry and psychology with special emphasis on objective methods and assessment criteria
[AGARD-CP-153] N75-24297
Proceedings of the Symposium on Digital Signal Processing
[SAND-74-8672] N75-24372
Proceedings of the 9th International Conference on High Energy Accelerators
[CONF-740522] N75-24448
Abstract reports: Presented at the meetings of the American Association for the Advancement of Science, May - December 1972
[PB-239274/4] N75-24538
H2 regions and the galactic centre
[ESRO-SP-105] N75-24555

CONFORMAL MAPPING
Microwave holography for analysis of conformal arrays --- antenna radiation patterns
[AD-A007359] N75-23953

CONGRESSIONAL REPORTS
Solar energy research and development
[GPO-40-684] N75-24104
Energy imports and the US balance of payments
[GPO-28-965] N75-24114
The economics of energy and natural resource pricing
[GPO-48-071] N75-24115
Energy Reorganization Act of 1974 --- the Energy Research and Development Administration and Nuclear Energy Commission
[S-REPT-93-1252] N75-24123
Energy Reorganization Act of 1974
[S-REPT-93-980] N75-24124
Energy and foreign policy
[GPO-22-562] N75-24125
Department of Housing and Urban Development-independent agencies appropriations for 1976. Part 2: National Aeronautics and Space Administration
[GPO-51-423] N75-24542

CONICAL FLOW
Constraints on the conical expansions in hydrodynamical models
[ORO-3992-198] N75-23894

CONICAL NOZZLES
Calculation of the radiative heat exchange in a conical cavity of complex configuration with an absorptive medium
N75-24272

CONJUGATE POINTS
Global optimality conditions and the Darboux point --- trajectory optimization
N75-24414

CONNECTICUT
An operational framework for coastal zone management planning
[PB-239519/2] N75-24090

CONSERVATION
More water for arid lands, promising technologies and research opportunities
[PB-239472/4] N75-24089

CONTACT RESISTANCE
Surface studies of cobalt alloys in ultra high vacuum utilizing contact resistance
N75-23745
Contact resistance studies of sintering using ultra clean copper surfaces in ultra high vacuum
N75-23983

CONTAMINATION
Studies on possible propagation of microbial contamination in planetary atmospheres
[NASA-CR-142825] N75-24296

CONTINENTAL SHELVES
On bottom density currents on the continental shelves
N75-24281
Laboratory investigation of internal wave generation models --- surface tides transfer energy to internal waves at continental shelf breaks
[AD-A007351] N75-24284

CONTINUOUS WAVE LASERS
Probes for density measurements of F2, HF, and DF in continuously operating chemical lasers
[SAND-74-0432] N75-23970

CONTINUOUS WAVE RADAR
Linearization of FM-CW radar sweep by feedback
[AD-A007867] N75-23551

CONTRACTION
Star formation and contraction/fragmentation problems
N75-24583

CONTROL
Evolution of turboreactor control systems
N75-23588

CONTROL EQUIPMENT
Power plant controls for aero-gas turbine engines
[AGARD-CP-151] N75-23575

CONTROL MOMENT GYROSCOPES
ATM CMG/EPEA
[NASA-CR-120760] N75-23673
A steering law for three double-gimbal control moment gyro systems
[NASA-TM-X-64926] N75-23925

CONTROL THEORY
Optimal Synthesis Program for Automatic Control [OSPAC] --- in FORTRAN
[AD-A007550] N75-24416
The problem of integration in the cybernetic system theory of Karl Deutsch
N75-24521

CONVECTIVE FLOW
An analytical study of thermal turbulence --- turbulent natural convection induced by heat flux in a layer of fluid
N75-23876

CONVECTIVE HEAT TRANSFER
Microconvection in evaporation and microconvection in ice formation
N75-24268

CONVOLUTION INTEGRALS
A digital algorithm for spectral deconvolution with noise filtering and peak picking: NOFIPP-DECON
[NASA-TM-X-64927] N75-24383

COOLING FINS
Condensation heat transfer inside horizontal tubes with internal axial fins --- including pressure gradients
N75-23877

COOLING SYSTEMS
The development of a solar residential heating and cooling system
[NASA-CR-142728] N75-24107
Aerodynamic design of cooling tower drift eliminators
[PB-238952/6] N75-24149

COPOLYMERS
The preparation and physical properties of polyester-poly [methyl methacrylates] triblock copolymers
[AD-A007347] N75-23689

COPPER
Determination of the shape, size, and orientation of defects by ultrasonic tests
N75-23749
Contact resistance studies of sintering using ultra clean copper surfaces in ultra high vacuum
N75-23983
Friction of the couples copper-copper, molybdenum-molybdenum, copper-molybdenum and copper-nickel in the ultrahigh vacuum
N75-24002

CORRELATION DETECTION
The approximation of correlation functions --- using Fourier transformation
[AD-A007664] N75-24423

CORROSION
Theory of the high temperature gas corrosion of metals beneath coatings
[TT-74-58010] N75-23781

CORROSION RESISTANCE
Examination of the influence of coatings on thin superalloy sections. Volume 2: Detailed procedures and data --- corrosion resistance
[NASA-CR-134792] N75-23756

CORROSION TESTS
Corrosion of austenitic stainless steel alloys due to HNO3-HF mixtures
[ICP-1036] N75-23765

CORTISONE
Effects of muscular exercise on variation in plasma cortisol and glucose in normal males
[NASA-TT-F-16257] N75-24326

COSMIC DUST
On the structure of M17S --- behavior of 9.7 micron band due to dust particles
N75-24563
Dust in H2 regions --- theoretical models of dusty nebulae
N75-24577
Ionisation structure and transfer of radiation in dusty nebulae
N75-24578
Calculation of infrared spectra from dust in planetary nebulae
N75-24580
The gas-to-dust ratio in the Orion nebula
N75-24581
Dust in the galactic center --- 9.7 micron band analysis
N75-24584
Radiative transfer in spherical circumstellar dust envelopes
N75-24603

COSMIC RAY SHOWERS
A cloud-chamber search for multiple-cores and high transverse-momenta in cosmic ray air showers --- particle density [concentration]
N75-24650

COST EFFECTIVENESS
Implications of equipping a DC-8-61 fleet with RNAV/two-segment approach avionics
[NASA-CR-137680] N75-23544
The high intensity solar cell: Key to low cost photovoltaic power
[NASA-TM-X-71718] N75-24108
Utilization analysis of energy systems
[PB-239291/8] N75-24144

COSTS
Variability of tidal datums and accuracy in determining datums from short series of observations
[COM-75-10275/6] N75-24291
The economic and environmental benefits from improving electrical rate structures
[PB-239451/8] N75-24541

COUETTE FLOW
Nonlinear Couette flow problem in collisional plasmas --- using Boltzmann distribution and Poisson equation
N75-24475

COUPLERS
A broadband digital diode phase shifter using a matrix interconnection of quadrature hybrid couplers, phase 1
[AD-A007294] N75-23864

COUPLING COEFFICIENTS
Remarks about the decays phi into phi plus 2 pions and phi into omega plus 2 pions --- using direct couplings and epsilon intermediate states
[PM/75/5] N75-24458

COVERINGS
The evaluation of NiCd cell covers. Part 1: Text and tables --- on circular and rectangular covers
[NLR-TR-74116-C-PT-1] N75-24016
The evaluation of NiCd cell covers. Part 2: Figures --- on circular and rectangular covers
[NLR-TR-74116-C-PT-2] N75-24017

CRACK INITIATION
A new model for the threshold condition for initiation and propagation of fatigue cracks
N75-24025

CRACK PROPAGATION
Prediction of static and fatigue damage and crack propagation in composite materials
N75-23699
Design of composite structure with respect to avoid crack propagation
N75-23709
Characteristics of crack propagation at the interface between two dissimilar media, phase 1
[AD-A007293] N75-23714
Fracture and fatigue crack growth behavior of surface flaws and flaws originating at fastener holes. Volume 2: Tabulated data
[AD-A003416] N75-23776
Critical potentials for stress corrosion cracking [mechanism of stress corrosion cracking] --- steeling ammonium carbonate solutions
[AD-A007273] N75-23778
A new model for the threshold condition for initiation and propagation of fatigue cracks
N75-24025
CGR: An improved computerized model to predict fatigue crack growth under spectrum loading
[AD-A007481] N75-24043

CRACKING [FRACTURING]
Investigation of smooth specimen scc test procedures; variations in environment, specimen size, stressing frame, and stress state --- for high strength aluminum alloys
[NASA-CR-120752] N75-23758

CRANES
High-capacity transport planes as modern air freight systems
[NASA-TT-F-16396] N75-23533

CRASH LANDING
Analysis of distress air cases in relation to crash position and intended track: 1968 - 1973
[AD-A007429] N75-23540

CREEP PROPERTIES
Numerical solution of the axisymmetric tasks of creep of circular cylindrical shells --- bending moments
[AD-A007476] N75-24042

CREEP RUPTURE STRENGTH
Effect of neutron irradiation on the microstructure and properties of titanium-stabilized type 316 stainless steels
[ORNL-TM-4731] N75-23973

CRITICAL FLOW
Critical flow and pressure ratio data for LOX flowing through nozzles
[NASA-TM-X-71725] N75-23883

CRITICAL POINT
Thermophysical properties of matter and substances, Volume 2 --- thermal conductivity, critical temperature, critical point, specific heat, and thermal expansion
[TT-72-52001-VOL-2] N75-23738
Experimental study of heat transfer in a critical point of sphere in hypersonic low-density flow
[AD-A007407] N75-23901

CRITICAL TEMPERATURE
Thermophysical properties of matter and substances, Volume 2 --- thermal conductivity, critical temperature, critical point, specific heat, and thermal expansion
[TT-72-52001-VOL-2] N75-23738

CRUDE OIL
Chemistry of organic sulfur compounds contained in petroleums and petroleum products, Volume 7
[TT-70-57759] N75-23691
X-ray analysis of metal traces in petroleums using ion exchange membranes
[NASA-TT-F-16288] N75-23724
Energy imports and the US balance of payments
[GPO-28-965] N75-24114
Energy and foreign policy
[GPO-22-562] N75-24125
Petroleum degradation in low temperature marine and estuarine environments
[AD-A007588] N75-24191
Digital film and precipitation meter, and oil pollution metering device
N75-24657

CRUISING FLIGHT
Jet interference of a podded engine installation at cruise conditions
N75-23490

CRYOGENIC EQUIPMENT
ERTS-C [Landsat 3] cryogenic heat pipe experiment definition
[NASA-CR-143797] N75-23882
ITS-K infrared cryogenic telescope-spectro-meter aboard Salyut-4
[NASA-TT-F-16355] N75-23936

CRYOGENIC ROCKET PROPELLANTS
Cryogenic mass flowmeter development
[AD-A007794] N75-23942

CRYSTAL DEFECTS
Determination of the shape, size, and orientation of defects by ultrasonic tests
N75-23749
Minority carrier kinetics in defect trap distributions in semiconductors: Application to trigonal selenium single crystals
N75-24497

CRYSTAL DISLOCATIONS
Research on the influence of dislocations on the diffraction of X rays and gamma rays on copper single crystals
N75-23751
Probabilistic approach to plasticity in polycrystalline materials using dislocation mechanics
[LBL-3384] N75-23789

CRYSTAL LATTICES
Effect of a long range interatomic potential on the stability of crystal lattices
[LBL-3151] N75-23767

CRYSTAL STRUCTURE
Study of alloy strengthening due to atomic order
[ORO-3935-43] N75-23769
Nuclear magnetic resonance studies of glasses and related crystalline materials
N75-23784

CRYSTALLOGRAPHY
Achievements and tasks of solid-state research in Hungary
N75-24658

CUBES [MATHEMATICS]
Laser geodynamic satellite thermal/optical/vibrational analysis and testing, volume 2, book 2 --- cubes and far fields
[NASA-CR-120756] N75-23935

CUMULATIVE DAMAGE
Residual stresses in notches produced by variable operational loads and their importance for the application of the linear cumulative damage hypothesis
[RAE-LIB-TRANS-1800] N75-24033

CURRENT DENSITY
Critical current density in superconducting niobium films
[CONF-740957-21] N75-24509
Effect of metallurgical history on Jc[5T] in surface diffused multifilamentary Nb3Sn
[BNL-19271] N75-24511

CURVATURE
Unsteady behavior of transonic flows --- shock induced oscillation
[MPIS-MITT-59] N75-23516

CYBERNETICS
The problem of integration in the cybernetic system theory of Karl Deutsch
N75-24521

CYCLIC HYDROCARBONS
Development of high stability fuel
[AD-A007574] N75-23604

CYGNUS CONSTELLATION
Spectral variability of Cyg X-3 --- X ray sources
[NASA-TM-X-70891] N75-24595
Temporal X-ray astronomy with a pinhole camera --- cygnus and scorpius constellation
[NASA-TM-X-70893] N75-24596

CYLINDRICAL SHELLS
Numerical solutions to the problems of electromagnetic radiation and scattering by a finite hollow cylinder
N75-23816
A finite element displacement approach for the elasto-plastic analysis of thin cylindrical shells
N75-24023
Inelastic response of ring-stiffened cylindrical shells to external pressure shock waves
[AD-A007329] N75-24041
Numerical solution of the axisymmetric tasks of creep of circular cylindrical shells --- bending moments
[AD-A007476] N75-24042

D

D REGION
An evaluation of the partial-reflection technique and results from the winter 1971-1972 D region
N75-24051
Ionospheric research --- E region, F region, D region
[NASA-CR-142830] N75-24210

D-2 SATELLITES
On the effects of solid lubrication on the torque of a ball bearing --- D2B satellite
N75-24000

DATA ACQUISITION
Defense Meteorological Satellite Program [DMSP]: User's guide.
[AD-A007678] N75-24256
Computer controlled data acquisition system for the high temperature sodium test facility
[HEDL-TME-74-60] N75-24533
National energy flow accounts
[PB-239275/1] N75-24539

DATA BASES
A 1964 digital data base for ionospheric modeling. Part B: Incoherent scatter radar results
[COM-75-10199/8] N75-23827

DATA COMPRESSION
Design of a digital voice data compression technique for orbiter voice channels
[NASA-CR-141790] N75-23820

DATA CONVERTERS
Space vehicle Viterbi decoder --- data converters, algorithms
[NASA-CR-141787] N75-23672

DATA CORRELATION
Multiple jet study data correlations --- data correlation for jet mixing flow of air jets
[NASA-CR-134795] N75-23572
Natural environment design criteria for the Solar Electric Propulsion Stage [SEPS]
[NASA-TM-X-64929] N75-23682
Correlation modulation --- data correlation
[AD-A007338] N75-23837

DATA LINKS
Source encoding for orbiter communications links
[NASA-CR-141792] N75-23653

DATA MANAGEMENT
On-line management information system feasibility in an R and D environment
[AD-A007723] N75-24528

DATA PROCESSING
Engineering and development program plan; en route control --- automatic flight data processing and air traffic control
[AD-A007623] N75-23550
Post-test navigation data analysis techniques for the shuttle ALT
[NASA-CR-141789] N75-23629
LANDSAT-2 launch and flight activation. Launch through orbit 50 and orbit adjust operation --- telemetry data processing
[NASA-CR-143744] N75-23630
Developing processing techniques for Skylab data --- using multispectral scanner
[E75-10289] N75-24062
World Weather Watch: Seventh status report on implementation
[WMO-401] N75-24234
Some procedural problems in automatic analysis of electrocardiograms
[NASA-TT-F-16357] N75-24316

DATA PROCESSING EQUIPMENT
An automated molecular fluorescence/absorption sequential analyzer with laser source
N75-23911
Data processor sizing for an Aeronautical Satellite Communications Center [ASCC]
[AD-A007624] N75-24408

DATA PROCESSING TERMINALS
Remote-terminal emulator [design verification model]: Introduction and summary
[AD-A007827] N75-24376

DATA REDUCTION
Application of computer controlled monitoring and data reduction to potentiometry and voltammetry
N75-24380

DATA STORAGE
A discrete simulation model of the revised AFMPC IOC microform system
[AD-A007776] N75-24537

DATA TRANSMISSION
Source encoding for orbiter communications links
[NASA-CR-141792] N75-23653
Brooknet: A high speed computer network --- data transmission
[BNL-19365] N75-24409

DEATH
The cause of death resulting from transfusion resistant shock. Part 1: Influence of brain damage
[MBL-1975-1] N75-24330
DECAY
Remarks about the decays phi into phi plus 2 pions and phi into omega plus 2 pions --- using direct couplings and epsilon intermediate states
[PM/75/5] N75-24458
DECISION MAKING
Evaluation of probability forecasts in meteorology
N75-24226
DECODERS
Space vehicle Viterbi decoder --- data converters, algorithms
[NASA-CR-141787] N75-23672
DEFORMATION
Role of deformation induced phase transformations in the plasticity of some iron-base alloys
[LBL-2775] N75-23768
DEGRADATION
Petroleum degradation in low temperature marine and estuarine environments
[AD-A007588] N75-24191
DELTA WINGS
Experimental study of heat transfer during flow around uncambered delta wings with blunted edges
[AD-A007316] N75-23524
Hydroaerodynamic characteristics of a low aspect ratio delta wing near a screen
[AD-A007649] N75-23529
DEMAND [ECONOMICS]
Electric power rights: One approach to rationing
[PB-238537/5] N75-24138
The residential user and the electrical load factor
[PB-238535/9] N75-24152
DENSIFICATION
Densification-mechanism modeling of the pressure-sintering behavior of MgAl2O4
N75-23984
DENSITY [MASS/VOLUME]
Correlation of materials properties with the atomic density concept
[NASA-CR-120751] N75-23727
DENSITY MEASUREMENT
Probes for density measurements of F2, HF, and DF in continuously operating chemical lasers
[SAND-74-0432] N75-23970
DEOXYRIBONUCLEIC ACID
Properties of uvrE mutants of Escherichia coli K12. Part 1: Effects of UV irradiation on DNA metabolism
[MBL-1974-25] N75-24332
Radiosensitization of biologically active DNA in cellular extracts by oxygen. Evidence that the presence of SH-compounds is not required
[MBL-1974-29] N75-24334
Purification and characterization of an endonuclease from calf thymus acting on irradiated DNA
[MBL-1974-35] N75-24340
DEPOSITION
Time dependent accretion disks around compact objects, part 1. Theoretical frameworks for analyzing and testing gravitation theories, part 2
N75-24604
DESIGN ANALYSIS
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 1: Summary report --- systems management evaluation and design analysis
[NASA-TM-X-66814] N75-23644
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 2: Program implementation and maturity --- systems management evaluation and design analysis
[NASA-TM-X-66815] N75-23645
Power processor for a 30cm ion thruster
[NASA-CR-134785] N75-23679
DESTRUCTIVE TESTS
Failure analysis of electronic parts: Laboratory methods --- for destructive and nondestructive testing
[NASA-SP-6508] N75-23853
DETECTORS
Development and evaluation of automobile crash sensors
[PB-237940/2] N75-23939
DETERGENTS
Development of a bench procedure for evaluating the effectiveness of dispersant detergent gasoline additives, phase 2
[AD-A006580] N75-24018
A method for the separation of oil from an aqueous oil, detergent solution prior to IR analysis, part 2
[AD-A006826] N75-24188
DETONATION
Project Rio Blanco: Project scientist's summary report of production test data and preliminary analysis of top chimney/cavity --- gas and radioactive analysis
[UCRL-76280] N75-24452
DEUTERIUM
Neutron diffraction studies of deuterium solid structures and transitions
[LA-UR-74-1716] N75-23788
Spheroidization of normal and deuterated polyethylene --- laser applications
[SAND-74-0318] N75-23996
DEUTERIUM COMPOUNDS
HF/DF chemical laser performance modification by chemical additives --- supersonic flow
[AD-A007263] N75-23976
DEUTERIUM PLASMA
The balance of rotating plasma slabs
[TRITA-EPP-74-19] N75-24482
DIAGNOSIS
Some procedural problems in automatic analysis of electrocardiograms
[NASA-TT-F-16357] N75-24316
DIAMAGNETISM
Magnetic torque on a rotating superconducting sphere
[NASA-TR-R-443] N75-24502
DICTIONARIES
Construction of a monolingual thesaurus on atmospheric pollution --- French language
N75-24531
DIELECTRICS
Radiation induced electrical current and voltage in dielectric structures
[AD-A007670] N75-23867
Investigation of new dielectrics for miniaturized high-performance capacitors
[NASA-TT-F-16383] N75-24506
DIESEL ENGINES
Polynuclear aromatic content of heavy duty diesel engine exhaust gases
[PB-238688/6] N75-24195
DIESEL FUELS
Ignition of military fuels by hot particles
[AD-A007728] N75-23803
DIFFERENCE EQUATIONS
Difference equation for superradiance
[NASA-CR-142875] N75-24439
DIFFERENTIAL EQUATIONS
As asymptotic ignition theory of porous solid fuels [thermo-diffusive theory] --- differential equations for the ignition of coal
N75-23798
Some self starting integrators for x Prime equals f [x, t] --- Runge-Kutta method and orbital position estimation
[NASA-CR-141784] N75-24419
Focusing problems in wave propagation: A method based on almost plane waves
N75-24461
DIFFUSE RADIATION
An example of the use of laboratory results in the optics of the sea
N75-24273
DIFFUSION COEFFICIENT
Diffusion length measurements using the scanning electron microscope --- in semiconductor devices
[NASA-TM-X-71724] N75-24014
Possible improvements to HF devices derived from irradiative control of the diffusion processes
[DTCE/3096] N75-24499
DIFLUORIDES
Probes for density measurements of F2, HF, and DF in continuously operating chemical lasers
[SAND-74-0432] N75-23970
DIGITAL COMPUTERS
Automation trends --- technology utilization of digital computers for production planning in chemical engineering
[UCRL-75320] N75-23728
An automated system for precision calibration of accelerometers
[COM-75-10147/7] N75-23957
Computer measurement of complex performance --- on digital computers
N75-24300
An asynchronous logic array
[PB-238681/1] N75-24374
Efficient simulation of a computer system --- for digital UNIVAC computers
N75-24381
DIGITAL DATA
TIMAVI: A computer program to time-average repetitively scanned digitized spectra --- nuclear magnetic resonance
[AD-A007849] N75-23733
A 1964 digital data base for ionospheric modeling. Part B: Incoherent scatter radar results
[COM-75-10199/8] N75-23827
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement curves. Part Q and R: Accelerograms IIQ233 to IIQ243 and IIR244 to IIR254
[PB-239587/9] N75-24225
DIGITAL FILTERS
Design of FIR digital filters for pulse shaping and channel equilization using time-domain optimization
N75-23817
Algebraic techniques for the analysis and design of digital filters --- computer-aided design program
N75-24370
Employment of the fast Fourier transform in digital filters
[RAE-LIB-TRANS-1834] N75-24384
DIGITAL INTEGRATORS
Some self starting integrators for x Prime equals f [x, t] --- Runge-Kutta method and orbital position estimation
[NASA-CR-141784] N75-24419
DIGITAL RADAR SYSTEMS
Theory and practice of geophysical survey design --- track-type geophysical surveys and algorithms applied to sampling problems
N75-24203
DIGITAL SIMULATION
A digital computer simulation of the annual snow and soil thermal regimes at Barrow, Alaska
[AD-A007734] N75-24082
Parameter identification in distributed systems using a digital simulation language: Using extension of PDEL
[PB-239431/0] N75-24404
DIGITAL SYSTEMS
Digital transmission evaluation project. RDS-80 test
[AD-A007111] N75-23839
A fast-initializing digital equalizer with on-line tracking for data communications
N75-23843
A testability measure for register-transfer level digital circuits
N75-23844
A broadband digital diode phase shifter using a matrix interconnection of quadrature hybrid couplers, phase 1
[AD-A007294] N75-23864
Proceedings of the Symposium on Digital Signal Processing
[SAND-74-8672] N75-24372
DIGITAL TECHNIQUES
The use of digital control for complex power plant management
N75-23596
Direct digital numerical controller for machine tools
[Y-1966] N75-24373
Digital film and precipitation meter, and oil pollution metering device
N75-24657
DIGITAL TO ANALOG CONVERTERS
Weather satellite picture receiving stations, APT digital scan converter
[NASA-TN-D-7994] N75-24231
DIGITAL TRANSDUCERS
Converter of non-electrical into electrical quantities, chapter 2 --- digital transducers in radio relay systems
N75-23854
DIMENSIONAL STABILITY
Fabrication and evaluation of an OSO-1 type baseplate --- dimensional stability testing
[NASA-CR-143794] N75-23985
Slope stability analysis: A computerized solution of Bishop's simplified method of slices
[PB-238954/2] N75-24548
DIODES
The 12 GHZ image and sum enhanced mixer diode converter
[NASA-CR-143792] N75-23848
DIRECT CURRENT
Properties and potential of BARITT devices --- barrier injection transit time devices
N75-24491
DIRECT POWER GENERATORS
Efficiency and weight of voltage multiplier type ultra lightweight dc-dc converters
[NASA-TM-X-71735] N75-23851
DIRECTIONAL ANTENNAS
Perturbation techniques for directivity optimization of Yagi-Uda arrays
N75-23813
DISKS
Time dependent accretion disks around compact objects, part 1. Theoretical frameworks for analyzing and testing gravitation theories, part 2
N75-24604
DISPLACEMENT MEASUREMENT
A finite element displacement approach for the elasto-plastic analysis of thin cylindrical shells
N75-24023
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement curves. Part Q and R: Accelerograms IIQ233 to IIQ243 and IIR244 to IIR254
[PB-239587/9] N75-24225
DISPLAY DEVICES
Evaluation of a Digital Display System [DDS] driven by an Automatic Meteorological Observing System AMOS 3-70
[AD-A008898] N75-23546
Advanced technical evaluation of a master monitor display
[AD-A007699] N75-23566
Aerodrome air traffic control in the Canadian Forces --- design of tower cabs for air traffic controller tasks
[DCIEM-74-R-1067] N75-24363

Real time display parameters study 2
[AD-A007790] N75-24367
Image descriptors for displays
[AD-A007585] N75-24536

DOCUMENT STORAGE
Evaluation and optimization of file organizations through analytic modeling
N75-24529

DOCUMENTATION
Study of a group of documentation systems in order to determine the interconnection and the exchange possibilities at the level of sectorial networks and to recommend the means necessary for this harmonization
N75-24530

DOPPLER EFFECT
Studies on measuring ultrasonic flow with the aid of the Doppler effect
[NASA-TT-F-16393] N75-23928
Pulse Doppler ambiguity resolution --- basic programming language
[AD-A007416] N75-24415

DOPPLER RADAR
Range-Doppler imaging of rotating objects
N75-23542

DRAG
Thrust/drag analysis for a front fan nacelle having two separate co-axial exhaust streams
[ARC-CP-1311] N75-23574

DRAG MEASUREMENT
Transonic off-design drag and performance of three mixed-compression axisymmetric inlets
[NASA-TM-X-3215] N75-23602

DRIFT RATE
Simulated snowdrift patterns: Evaluation of geometric modeling criteria for a three dimensional structure
[AD-A007735] N75-24050
Drift wave instabilities in plasmas with shear flow
[MPI-PAE/EXTRATERR-106] N75-24476
Velocity variations of an Equatorial plume throughout a Jovian year
[NASA-CR-142894] N75-24639

DROP SIZE
An analysis of droplet size distribution during monopropellant spray combustion
N75-23799

DROPS (LIQUIDS)
Rotating, charged or gravitating liquid drop, and problems in nuclear physics and astronomy
[LBL-3363] N75-24451

DRUGS
Industrial energy study of the drug manufacturing industries for the Federal Energy Administration/US Department of Commerce
[PB-238994/8] N75-24130

DRY FRICTION
Possible applications of surface treatment to ultrahigh vacuum friction for space utilization
N75-23626
Third body formation and elimination on carbon fiber epoxy composite --- effects on friction and wear
N75-24004

DUCTED FLOW
A study of reacting free and ducted hydrogen/air jets
[NASA-TM-X-72678] N75-23571

DUCTILITY
The effect of grain size and retained austenite on the ductile-brittle transition of a titanium-gettered iron alloy
[AD-A007360] N75-23780

DYE LASERS
Output energy optimization of a dye laser --- for intense flashlamp excitation, noting detrimental ultrasonic wave effect
N75-23807
Time development of ultrashort pulse generation from a Nd:glass laser with a saturable dye and short laser pulse damage of GaAs and ZnTe at 1.06 microns
N75-23964
A tunable dye laser diagnostic facility --- optical pumping and molecular energy levels
[AD-A007620] N75-23979

DYES
Holographic recording materials development --- using stilbene, indigo, and thioindigo derivatives
[NASA-CR-132672] N75-23930

DYNAMIC LOADS
Study on the behavior of layered glass-resin under dynamic load [fatigue]
N75-24030

DYNAMIC MODELS
Construction of a dynamic airport system
[TT-7408] N75-23612
Dynamic analysis of a satellite with deformable parts --- GEOS satellite dynamic model for attitude control system design
[ESRO-SR-22-ESTEC] N75-23670
Solid state camera
[MBB/MC-GD-2036/73] N75-23917
Estimation of structural dynamic model parameters from transient response data
N75-24022
Importance of validation in ecosystem analysis
[CONF-750202-2] N75-24047

DYNAMIC PRESSURE
Inelastic response of ring-stiffened cylindrical shells to external pressure shock waves
[AD-A007329] N75-24041

DYNAMIC RESPONSE
Generalized dynamic engine simulation techniques for the digital computers
N75-23593

DYNAMIC STRUCTURAL ANALYSIS
Comparison of flight measurements with predictions from aeroelastic models in the NASA Langley Transonic Dynamics Tunnel
[NASA-TM-X-72686] N75-23610
A structural dynamics model for flexible solar arrays of the communications technology satellite
[CRC-1268] N75-24034
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement Curves. Parts O and P: Accelerograms IIO198 to IIO201, IIO204 to IIO208, IIO210, IIO213, IIP214 to IIP223, and IIP232
[PB-239586/1] N75-24224

E

E REGION
An investigation of odd nitrogen in the ionospheric E region
N75-24204
Ionospheric research --- E region, F region, D region
[NASA-CR-142830] N75-24210

EARTH (PLANET)
Jupiter and planet Earth --- planetary and biological evolution and natural satellites
[NASA-TM-X-66829] N75-24633

EARTH RESOURCES
A survey of earth resources on Apollo 9 photography
[NASA-CR-142900] N75-24063
A man-machine procedure for extracting information from data collected by the Earth Resources Technology Satellite
[PB-238431/1] N75-24073
Assessment of uranium and thorium resources in the United States and the effect of policy alternatives
[PB-238658/9] N75-24133

EARTH RESOURCES PROGRAM
A survey of earth resources on Apollo 9 photography
[NASA-CR-142900] N75-24063

EARTH RESOURCES SURVEY AIRCRAFT
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-1] N75-24064
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-2] N75-24065

EARTHQUAKES
Fault tectonics and earthquake hazards in the Peninsular Ranges, Southern California --- Mojave Desert
[E75-10284] N75-24057
Strong motion earthquake accelerograms digitized and plotted data. Volume 1: Uncorrected accelerograms, part R: Accelerograms IR244 through IR254. Accelerograms from the San Fernando, California earthquake of 1971
[PB-239585/3] N75-24223
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement Curves. Parts O and P: Accelerograms IIO198 to IIO201, IIO204 to IIO208, IIO210, IIO213, IIP214 to IIP223, and IIP232
[PB-239586/1] N75-24224
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement curves. Part Q and R: Accelerograms IIQ233 to IIQ243 and IIR244 to IIR254
[PB-239587/9] N75-24225

ECOLOGY
A conceptual model for the movement of pesticides through the environment: A contribution of the EPA alternative chemicals program
[PB-238653/0] N75-24200
Applied systems ecology: Models, data, and statistical methods
[BNWL-SA-5216] N75-24425

ECONOMIC ANALYSIS
The economics of energy and natural resource pricing
[GPO-48-071] N75-24115
Demonstration plant, clean boiler fuels from coal. Volume 3: Preliminary design/economics analysis
[PB-238529/2] N75-24127

ECONOMIC FACTORS
Highway travel forecasts
[PB-239169/6] N75-24549

ECOSYSTEMS
Importance of validation in ecosystem analysis
[CONF-750202-2] N75-24047

EDGES
Using blossoms to find maximum matchings on graphs
[PB-238971/6] N75-24377

EDITING ROUTINES (COMPUTERS)
COBOL compiler validation system [1974] [X3.23-1974] ANS COBOL 1974. Interprogram communication module test specifications --- including editing routines
[AD-A002975] N75-24375

EDUCATIONAL TELEVISION
Cost competitiveness of a solar cell array power source for ATS-6 educational TV terminal
[NASA-TM-X-71720] N75-24110

EFFICIENCY
Summary of high efficiency silicon solar cell meeting held at NASA-Lewis
[NASA-TM-X-71729] N75-23681

EJECTION SEATS
Emergency ejection, sequence of operation
[AD-A007470] N75-23539

ELASTIC DEFORMATION
Reproduction of the interaction of aerodynamic loads and structural distortions during strength tests
[AD-A007661] N75-23520
Dynamic analysis of a satellite with deformable parts --- GEOS satellite dynamic model for attitude control system design
[ESRO-SR-22-ESTEC] N75-23670
Anelastic deformation of boron fibers --- vapor deposited fibers
[NASA-TM-X-71710] N75-23697

ELASTIC PROPERTIES
Inelastic behaviour of composites [plastic prediction by limit analysis]
N75-23702
Inelastic response of ring-stiffened cylindrical shells to external pressure shock waves
[AD-A007329] N75-24041

ELASTIC SCATTERING
Tables of scattering amplitudes, spin polarizations and phase shifts of 25 eV to 1500 eV electrons scattered elastically from Li, Na, Mg, P, K, Ca, Sc, Mn, Ga, Br, Sr, Mo, Rh, Cd, Ba, W, and Os, 3
[AD-A007055] N75-23739

ELASTIC WAVES
On the effect of a pressure wave on a spherical shell
N75-24036

ELASTOHYDRODYNAMICS
Effect of longitudinal surface finish on elastohydrodynamic lubrication
[NASA-TN-D-7967] N75-23990
The background to current theories of scuffing --- a study of boundary lubrication, sliding friction, and elastohydrodynamics
[S/T-MEMO-5/73] N75-23991
Elastohydrodynamic lubrication in line contact --- gears and film thickness
N75-23992
Physics of the sea and atmosphere
[NASA-TT-F-16225] N75-24262

ELASTOMERS
Concerning the nature of rubber glass: Transition of elastomeric materials
[AD-A007348] N75-23796

ELASTOPLASTICITY
A finite element displacement approach for the elasto-plastic analysis of thin cylindrical shells
N75-24023

ELECTRIC CONNECTORS
Investigation of problems associated with solid encapsulation of high voltage electronic assemblies; also Reynolds connector study
[NASA-CR-142803] N75-23849

ELECTRIC CURRENT
Radiation induced electrical current and voltage in dielectric structures
[AD-A007670] N75-23867

ELECTRIC DISCHARGES
Study and application of pulsed CO2 lasers --- noting excitation by electric discharges and electron beam
N75-23808

ELECTRIC ENERGY STORAGE
An investigation of the theoretical limitations of a converter capacitor circuit during the charging and storage phases
N75-23845

ELECTRIC FIELDS
Catalog of particles and fields data 1958 - 1965
[NASA-TM-X-72574] N75-24211
Catalog of particles and fields data 1966-1973
[NASA-TM-X-72575] N75-24212
Electron plasma oscillations in a static electric field
[TRITA-EPP-74-21] N75-24484

ELECTRIC GENERATORS
Electric power for space satellites
[NASA-TM-X-66808] N75-23678
Electric power generation utilizing a heat pipe turbine-generator
N75-24096
Solar energy for process steam generation
[PB-238109/3] N75-24154

ELECTRIC MOTORS
Practical stability of a reluctance synchronous machine
[AD-A007659] N75-23605
ELECTRIC POWER
The economic and environmental benefits from improving electrical rate structures
[PB-239451/8] N75-24541
ELECTRIC POWER PLANTS
Electric power systems analysis research
[PB-239236/3] N75-24139
Conference proceedings, Steam Power Plant Workshop
[PB-239514/3] N75-24148
Aerodynamic design of cooling tower drift eliminators
[PB-238952/6] N75-24149
Real-time characterization of particles emitted by coal-fired power generating plant --- air pollution control
N75-24160
Evaluation of power facilities; A reviewer's handbook --- electric and nuclear power plants
[PB-239221/5] N75-24198
ELECTRIC POWER SUPPLIES
Electric power rights: One approach to rationing
[PB-238537/5] N75-24138
An approach to the power shortage problem: Optimal allocation of existing excess reserves through interregional transmission
[PB-238578/9] N75-24151
The residential user and the electrical load factor
[PB-238535/9] N75-24152
ELECTRIC POWER TRANSMISSION
Load and frequency control for interconnected power systems
[PB-239278/5] N75-23857
An approach to the power shortage problem: Optimal allocation of existing excess reserves through interregional transmission
[PB-238578/9] N75-24151
ELECTRIC PROPULSION
On the electric propulsion/mission system: Energy, constraints, and characteristic surfaces --- for low thrust space flight
N75-23674
ELECTRIC STIMULI
Spinal effects of an electrical vestibular stimulation in man
[NASA-TT-F-16314] N75-24318
ELECTRICAL FAULTS
Functioning of power rectifiers and thyristors from 1 January 1970 to 31 December 1972, noting carrier injection, emitter shorts, ignition, and breakdown
[NASA-TT-F-16365] N75-23850
Fault detection through parallel processing in Boolean algebra
[AD-A007552] N75-24397
ELECTRICAL INSULATION
Preliminary studies for high tension integrated circuits --- including electrical insulation and resistivity
[MDB/MD-3055] N75-23847
Electrotechnical handbook, volume 1, book 1, 4th edition revised selected parts 6 and 10
[AD-A003088] N75-23856
Research lab at Turda Electroceramica Plant described
N75-24661
ELECTRICAL PROPERTIES
Coal processing by electrofluidics
[PB-238973/2] N75-23741
Electrical transport properties in n GaSb under hydrostatic pressure
N75-24496
Some electrical and photoelectrical properties of CdSnP2 single crystals
[AD-A007863] N75-24517
ELECTRICAL RESISTANCE
Investigation of the galvanomagnetic properties of graphite in magnetic fields up to 500 kOe at low temperatures --- the Hall effect and electrical resistance
[NASA-TT-F-16387] N75-23787
ELECTRICAL RESISTIVITY
Preliminary studies for high tension integrated circuits --- including electrical insulation and resistivity
[MDB/MD-3055] N75-23847
Advances in the theory and application of BSF cells --- including electrical resistivity and photovoltaic cells
[NASA-TM-X-71723] N75-24112
Research for preparation of cation-conducting solids by high-pressure synthesis and other methods
[NASA-CR-134836] N75-24504
ELECTRICITY
Solar photothermal power conversion
N75-24100
ELECTROCARDIOGRAPHY
Some procedural problems in automatic analysis of electrocardiograms
[NASA-TT-F-16357] N75-24316
ELECTROCHEMICAL CORROSION
Corrosion fatigue of type 304 stainless steel in H2SO4 + NaCl at 25 C
N75-23748
The evaluation of NiCd cell covers. Part 1: Text and tables --- on circular and rectangular covers
[NLR-TR-74116-C-PT-1] N75-24016
ELECTRODEPOSITION
Diffusion layers formed in salt media and molten oxides --- using spontaneous or electrolytic deposit techniques
[NASA-TT-F-16381] N75-23757
ELECTROENCEPHALOGRAPHY
Some fast analytical techniques for the EEG --- using probability distribution function and hybrid computers
N75-24305
ELECTROMAGNETIC FIELDS
Electromagnetic fields generated by turbulent air flow and shock waves
[WTHD-68] N75-24431
ELECTROMAGNETIC INTERFERENCE
Electromagnetic interference specification limits for air route traffic control centers
[AD-A008926] N75-23547
ELECTROMAGNETIC NOISE
Electromagnetic noise in McElroy Mine
[COM-74-11717/7] N75-23826
ELECTROMAGNETIC RADIATION
Numerical solutions to the problems of electromagnetic radiation and scattering by a finite hollow cylinder
N75-23816
Bibliography of the Electromagnetics Division, 30 June 1973 - 30 June 1974
[COM-75-10161/8] N75-23842
Frequency mixing of electromagnetic waves in plasmas by collisional processes
N75-24473
ELECTROMAGNETIC SCATTERING
Numerical solutions to the problems of electromagnetic radiation and scattering by a finite hollow cylinder
N75-23816
Frequency mixing of electromagnetic waves in plasmas by collisional processes
N75-24473
ELECTRON ACCELERATORS
Proceedings of the 9th International Conference on High Energy Accelerators
[CONF-740522] N75-24448
ELECTRON BEAMS
Electron beam semiconductor device with mesa diode, reliability and failure determination
[AD-A007277] N75-23860
Molecular lasers in E-beam stabilized discharges
[AD-A007577] N75-23980
Generation of monochromatic electrostatic waves of large amplitudes in a bounded beam-plasma system
[LRP-88/74] N75-24481
Non-linear stabilization of beam plasma interactions by parametric effects
[AD-A007487] N75-24488
ELECTRON BOMBARDMENT
Void nucleation and growth in heavy ion and electron bombarded pure metals --- considering He influence
[COO-2206-5] N75-23763
ELECTRON CAPTURE
Report on the Brookhaven solar neutrino experiment
[BNL-19278] N75-24652
ELECTRON ENERGY
Determination of electron temperature in a penning discharge by the helium line ratio method
[NASA-TM-X-71677] N75-24478
ELECTRON IRRADIATION
Effect of electron irradiation in vacuum on FEP-A silicon solar cell covers
[NASA-TM-X-71713] N75-23668
Absorption and luminescence of glasses during electron irradiation
[BNL-19348] N75-23790
Irradiation effects on reactor structural materials
[HEDL-TME-74-51] N75-24038
Possible improvements to HF devices derived from irradiative control of the diffusion processes
[DTCE/3096] N75-24499
ELECTRON MICROSCOPES
Possible utilization of electron scan microscope for the study of composite materials with organic matrix
N75-23708
Diffusion length measurements using the scanning electron microscope --- in semiconductor devices
[NASA-TM-X-71724] N75-24014
ELECTRON PLASMA
Electron plasma oscillations in a static electric field
[TRITA-EPP-74-21] N75-24484
ELECTRON PRECIPITATION
Electron precipitation in the post midnight sector of the auroral zones --- on the Explorer 40 satellite
[NASA-CR-142812] N75-24209
ELECTRON SCATTERING
Tables of scattering amplitudes, spin polarizations and phase shifts of 25 eV to 1500 eV electrons scattered elastically from Li, Na, Mg, P, K, Ca, Sc, Mn, Ga, Br, Sr, Mo, Rh, Cd, Ba, W, and Os, 3
[AD-A007055] N75-23739
ELECTRON STATES
Atmospheric phenomena --- auroras, electron states, nitrogen, nitrogen oxides
[AD-A007792] N75-24218
ELECTRON TUNNELING
Electron tunneling in semimetallic films
N75-24490
Electronic tunneling and structure of superconducting niobium single crystals
[AD-A007580] N75-24515
ELECTRONIC CONTROL
Engine control for harpoon missile system
N75-23580
A new lightweight fuel control system for electrical inputs --- considering gas turbine engines
N75-23599
ELECTRONIC EQUIPMENT
Electronic docking systems
[COM-75-10139/4] N75-23869
ELECTRONIC EQUIPMENT TESTS
Failure analysis of electronic parts: Laboratory methods --- for destructive and nondestructive testing
[NASA-SP-6508] N75-23853
ELECTRONIC PACKAGING
Investigation of problems associated with solid encapsulation of high voltage electronic assemblies; also Reynolds connector study
[NASA-CR-142803] N75-23849
ELECTRONIC TRANSDUCERS
Converter of non-electrical into electrical quantities, chapter 2 --- digital transducers in radio relay systems
N75-23854
ELECTROPLATING
Thermal neutron filter cadmium electroplate properties
[ANCR-1189] N75-23711
ELECTROSTATIC WAVES
Generation of monochromatic electrostatic waves of large amplitudes in a bounded beam-plasma system
[LRP-88/74] N75-24481
ELECTROSTATICS
Design study for a sensor utilizing an electrostatic camera. Volume 2: Appendices
[AD-A007070] N75-23940
ELEMENTARY EXCITATIONS
Polarization potentials and elementary excitations in strongly interacting quantum liquids
N75-23875
Effect of the quasiparticle-pair interference current on thermal fluctuations in weakly coupled superconductors and on the operation of RF-biased SQUIDS
N75-24494
ELEVATORS [LIFTS]
High-capacity transport planes as modern air freight systems
[NASA-TT-F-16396] N75-23533
ELLIPTICAL CYLINDERS
Unsteady stall of a slender elliptic cylinder in a freestream of sinusoidally varying angle of incidence
N75-23473
Unsteady momentum integral analysis of the laminar boundary layer on an elliptic cylinder oscillating in pitch
N75-23878
ELLIPTICAL POLARIZATION
Some methods of receiving polarization modulation signals, chapter 6
N75-23823
EMISSION SPECTRA
Nonequilibrium radiation model for exhaust plumes
[AD-A007795] N75-23687
Nuclei and H2 regions in spiral galaxies: Preliminary results for M 101
N75-24575
EMULSIONS
Water-base coatings
[AD-A007851] N75-24011
ENAMELS
Survey of coatings for solar collectors --- ceramic enamels and chromium
[NASA-TM-X-71730] N75-23989
ENCAPSULATING
Investigation of problems associated with solid encapsulation of high voltage electronic assemblies; also Reynolds connector study
[NASA-CR-142803] N75-23849
ENCEPHALITIS
Respiratory and intraperitoneal infection of mice with encephalomyocarditis virus: Effect of sublethal X-irradiation on host resistance and survival
[MBL-1975-2] N75-24331
ENERGY BANDS
The effects of topology on the properties of random network models for amorphous Group 4 semiconductors --- germanium, silicon, and energy bands
N75-24495
ENERGY BUDGETS
Earth radiation budget measurement from a spinning satellite: Conceptual design of detectors
[NASA-CR-132494] N75-23920

ENERGY CONSERVATION
An interdisciplinary engineering approach to a facility design study with emphasis on energy conservation. Volume 2: Main report text
[AD-A006804] N75-24129

ENERGY CONSUMPTION
Path to self-sufficiency directions and constraints --- a model of US energy supply system
[PB-239099] N75-24128
Utilization analysis of energy systems
[PB-239291/8] N75-24144
The residential user and the electrical load factor
[PB-238535/9] N75-24152

ENERGY CONVERSION
Selected contributions to high-speed physics --- covering mechanical-electrical energy conversion in ferroelectric ceramics, and mode locked pulsed lasers
[BMVG-FBWT-74-8] N75-23804
Nonlinear conversion of ferroelectric energy and energy conversion by forced transition with Pb[Zr sub [1-x]Ti sub x]O3 ceramics
N75-23805
Energy: A continuing bibliography with indexes, February 1975 --- solar energy, energy conversion
[NASA-SP-7043[03]] N75-24094

ENERGY DISTRIBUTION
Reaction rates and energy distributions among reaction products for the H plus Cl2 and Cl plus H2 reactions
[AD-A007782] N75-23735
Distribution of energy in the ocean and atmosphere as a result of their thermal and dynamic interactions
N75-24280

ENERGY POLICY
Feasibility study of a satellite solar power station
[NASA-CR-2357] N75-23683
Energy: A continuing bibliography with indexes, February 1975 --- solar energy, energy conversion
[NASA-SP-7043[03]] N75-24094
Photovoltaic solar power systems
N75-24098
Space satellite power system --- conversion of solar energy by photovoltaic solar cell arrays
[NASA-CR-142799] N75-24099
Solar photothermal power conversion
N75-24100
Oceanic and atmospheric energy sources
N75-24101
The national solar energy program
N75-24102
The energy plantation
N75-24103
Solar energy research and development
[GPO-40-684] N75-24104
The high intensity solar cell: Key to low cost photovoltaic power
[NASA-TM-X-71718] N75-24108
The effect of sunshine testing on terrestrial solar cell system components
[NASA-TM-X-71722] N75-24109
Energy imports and the US balance of payments
[GPO-28-965] N75-24114
The economics of energy and natural resource pricing
[GPO-48-071] N75-24115
A compressor designed for the energy research and development agency automotive gas turbine program
[NASA-TM-X-71719] N75-24116
Standardized solar simulator tests of flat plate solar collectors. 1: Soltex collector with two transparent covers
[NASA-TM-X-71738] N75-24118
Energy Reorganization Act of 1974 --- the Energy Research and Development Administration and Nuclear Energy Commission
[S-REPT-93-1252] N75-24123
Energy Reorganization Act of 1974
[S-REPT-93-980] N75-24124
Energy and foreign policy
[GPO-22-562] N75-24125
Study of the application of HTGR to a petroleum refinery petrochemical complex
[CONF-741144-1] N75-24126
Demonstration plant, clean boiler fuels from coal. Volume 3: Preliminary design/economics analysis
[PB-238529/2] N75-24127
Path to self-sufficiency directions and constraints --- a model of US energy supply system
[PB-239099] N75-24128
Technology and use of lignite
[PB-238666/2] N75-24131
Photochemical conversion of solar energy
[PB-238533/4] N75-24132
Assessment of uranium and thorium resources in the United States and the effect of policy alternatives
[PB-238658/9] N75-24133
Where the boilers are: A survey of electric utility boilers with potential capacity for burning solid waste as fuel
[PB-239392/4] N75-24135
Terrestrial photovoltaic power systems with sunlight concentration
[PB-238506/0] N75-24136
Chemical vapor deposition research for fabrication of solar energy converters
[PB-238947/6] N75-24137
Electric power rights: One approach to rationing
[PB-238537/5] N75-24138
Energy system modeling-interfuel competition
[PB-239292/6] N75-24140
Proceedings of 5th annual symposium: Energy Research and Development --- solar energy, windpower utilization, thermonuclear power generation
[AD-A007799] N75-24142
Utilization analysis of energy systems
[PB-239291/8] N75-24144
A preliminary technology assessment of ocean thermal gradient energy generation
[PB-238646/4] N75-24147
An approach to the power shortage problem: Optimal allocation of existing excess reserves through interregional transmission
[PB-238578/9] N75-24151
Solar energy for process steam generation
[PB-238109/3] N75-24154
Path to self-sufficiency directions and constraints, appendices --- a computer program that calculates energy resource requirements
[PB-239100/1] N75-24155
Proceedings of the Solar Thermal Conversion Workshop
[PB-239277/7] N75-24157
NSF-RANN energy abstracts. A monthly abstract journal of energy research
[ORNL-EIS-74-52-VOL-2-NO-6] N75-24532

ENERGY REQUIREMENTS
Path to self-sufficiency directions and constraints, appendices --- a computer program that calculates energy resource requirements
[PB-239100/1] N75-24155

ENERGY SOURCES
The economics of energy and natural resource pricing
[GPO-48-071] N75-24115
Energy and foreign policy
[GPO-22-562] N75-24125
The impact of energy shortages on the iron and steel industries
[PB-238749/6] N75-24158
National energy flow accounts
[PB-239275/1] N75-24539

ENERGY SPECTRA
Electron precipitation in the post midnight sector of the auroral zones --- on the Explorer 40 satellite
[NASA-CR-142812] N75-24209

ENERGY TECHNOLOGY
Solar energy research and development
[GPO-40-684] N75-24104
Symposium on the Material Science Aspects of Thin Film Systems for Solar Energy Conversion
[PB-239270/2] N75-24150

ENERGY TRANSFER
Laboratory investigation of internal wave generation models --- surface tides transfer energy to internal waves at continental shelf breaks
[AD-A007351] N75-24284
Measurement of several rate coefficients for the He-Ne laser plasma
N75-24472

ENGINE CONTROL
An application of modern control theory to jet propulsion systems --- considering onboard computer
[NASA-TM-X-71726] N75-23573
Power plant controls for aero-gas turbine engines
[AGARD-CP-151] N75-23575
Contribution of flight simulation tests to the study of turbomachine control
N75-23577
An airframe manufacturer's requirements for future propulsion controls
N75-23578
Control system requirements dictated by optimization of engine operation
N75-23579
Reliability specification for gas turbine control systems
N75-23581
Control design considerations for variable geometry engines
N75-23583
PRAC: A new aero gas turbine engine control concept
N75-23584
Helicopter engine control: The past 20 years and the next
N75-23585
Equilibrium performance analysis of gas turbine engines using influence coefficient techniques
N75-23592
Use of simulation in the design, development and testing of power plant control systems
N75-23595
The use of digital control for complex power plant management
N75-23596
Fluidic sensors for turbojet engines
N75-23598

ENGINE DESIGN
NASA refan program status --- for noise reduction of JT8D turbofan engine
[NASA-TM-X-71705] N75-23570

ENGINE NOISE
NASA refan program status --- for noise reduction of JT8D turbofan engine
[NASA-TM-X-71705] N75-23570

ENGINE TESTS
Alcohol assisted hydrocarbon fuels: A comparison of exhaust emissions, power output and fuel consumption using static and dynamic engine test facilities
N75-24012

ENTROPY
A maximum entropy filter --- a discussion of fast Fourier transformations and signal processing
[AD-A007482] N75-23834

ENVIRONMENT EFFECTS
Acquisition system environmental effects study --- for capillary-screen propellant retention devices
[NASA-CR-120768] N75-23684
Environmental aspects of run-off and siltation in the Anacostia basin from hyperaltitude photographs
[NASA-TM-X-70888] N75-24067
Assessment of possible environmental effects of space shuttle operations
[NASA-CR-129003] N75-24162
Evaluation of power facilities; A reviewer's handbook --- electric and nuclear power plants
[PB-239221/5] N75-24198

ENVIRONMENT MANAGEMENT
Regional environmental analysis and management: New techniques for current problems
[NASA-TM-X-66813] N75-24546

ENVIRONMENT POLLUTION
Symposium proceedings: Environmental Aspects of Fuel Conversion Technology
[PB-238304/0] N75-24179
A conceptual model for the movement of pesticides through the environment: A contribution of the EPA alternative chemicals program
[PB-238653/0] N75-24200

ENVIRONMENTAL CONTROL
Proceedings of seminar on methodology for monitoring the marine environment
[PB-239052/4] N75-24178

ENVIRONMENTAL QUALITY
Abstract reports: Presented at the meetings of the American Association for the Advancement of Science, May - December 1972
[PB-239274/4] N75-24538

ENZYME ACTIVITY
A changed ATP-dependent DNAase: The characterization of the enzyme from Escherichia coli rorA
[MBL-1974-38] N75-24314
Purification and characterization of an endonuclease from calf thymus acting on irradiated DNA
[MBL-1974-35] N75-24340

EPITAXY
Piezoelectric aluminum nitride films
[AD-A007657] N75-24518

EPOXY RESINS
Characteristics of crack propagation at the interface between two dissimilar media, phase 1
[AD-A007293] N75-23714
Material characterization of the fracture of filament, reinforced composites --- including carbon and glass fiber reinforced plastics
[AD-A007386] N75-23717
Thermal strain determination using gages imbedded in plastic material mock-ups under time-dependent temperature variations
N75-23918
Study on the behavior of layered glass-resin under dynamic load [fatigue]
N75-24030

EQUALIZERS [CIRCUITS]
Design of FIR digital filters for pulse shaping and channel equilization using time-domain optimization
N75-23817

EQUATIONS OF STATE
Shock waves in hydrogen isotopes and their high pressure equation of state
[UCRL-75727] N75-24513

EQUILIBRIUM EQUATIONS
Plasma equilibria with closed magnetic field lines
N75-24474

EQUILIBRIUM METHODS
Equilibrium performance analysis of gas turbine engines using influence coefficient techniques
N75-23592

EQUIPMENT SPECIFICATIONS
Pumping system design related to fuel system specifications
N75-23600
Design, evaluation and applications of a vidicon rapid scanning spectrophotometer
N75-23913

EROSION
Temperature dependence of particulate erosion --- tungsten and zirconium carbides
[AD-A007841] N75-24459

ERROR ANALYSIS
Engineering of quality software systems [a software error classification methodology]
[AD-A007772] N75-24393
ESCHERICHIA
Studies on propagation of microbes in the airborne state
[NASA-CR-142757] N75-24294
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 2: Studies on the specificity of initiation of transcription
[MBL-1975-5] N75-24312
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 3: Evidence for positive control of transcription
[MBL-1975-6] N75-24313
Properties of uvrE mutants of Escherichia coli K12. Part 2: Construction and properties of pol and rec derivatives
[MBL-1974-26] N75-24333
Mutagenesis by ultraviolet radiation in bacteriophage PHI X 174: On the mutation stimulating processes induced by ultraviolet radiation in the host bacterium
[MBL-1974-30] N75-24335
ETHYL ALCOHOL
Laboratory assessment of pilot performance using nonrated subjects at three alcohol dose levels
[AD-A007727] N75-24349
ETHYLENE
Effect of electron irradiation in vacuum on FEP-A silicon solar cell covers
[NASA-TM-X-71713] N75-23668
The oxidation of ethylene in automotive engine exhaust gas; an experimental investigation
N75-23719
EULER-LAGRANGE EQUATION
Dynamic analysis of a satellite with deformable parts --- GEOS satellite dynamic model for attitude control system design
[ESRO-SR-22-ESTEC] N75-23670
EUROPE
European scientific notes. Volume 29 number 3
[AD-A007612] N75-24535
EUROPEAN SPACE PROGRAMS
Image-storage tube for space applications. Development of the SEC target --- methods to assess target resolution, target stabilization
[ESRO-CR-212] N75-23938
EVAPORATIVE COOLING
Microconvection in evaporation and microconvection in ice formation
N75-24268
EVOLUTION [DEVELOPMENT]
Chemical evolution
[LBL-3319] N75-24369
EXERCISE [PHYSIOLOGY]
Effects of muscular exercise on variation in plasma cortisol and glucose in normal males
[NASA-TT-F-16257] N75-24326
EXHAUST GASES
An experimental study of jet exhaust simulation
N75-23501
A model technique for exhaust system performance testing
N75-23502
Exhaust plume temperature effects on nozzle afterbody performance over the transonic Mach number range
N75-23504
Thrust/drag analysis for a front fan nacelle having two separate co-axial exhaust streams
[ARC-CP-1311] N75-23574
The oxidation of ethylene in automotive engine exhaust gas; an experimental investigation
N75-23719
Alcohol assisted hydrocarbon fuels: A comparison of exhaust emissions, power output and fuel consumption using static and dynamic engine test facilities
N75-24012
Assessment of possible environmental effects of space shuttle operations
[NASA CR-129003] N75-24162
Field testing: Application of combustion modifications to control pollutant emissions from industrial boilers, phase 1
[PB-238920/3] N75-24185
Polynuclear aromatic content of heavy duty diesel engine exhaust gases
[PB-238688/6] N75-24195
EXHAUST NOZZLES
Reynolds number effects on boattail drag of exhaust nozzles from wind tunnel and flight tests
N75-23506
EXOBIOLOGY
Problems of space biology. Volume 26: Statistical analysis of the cardiac rhythm and hemodynamic indices in physiological research
[NASA-TT-F-16196] N75-24324
EXOSPHERE
The effects of field aligned ionization models on the electron densities and total flux tubes contents deduced by the method of whistler analysis
[AERONOMICA-ACTA-A-139-1974]
N75-24205
EXPANSION
The use of supernovae light curves for testing the expansion hypothesis and other cosmological relations
N75-24592
EXPERIMENTAL DESIGN
Advanced overrunning clutch technology, design phase
[AD-A007815] N75-23562
EXPLORER 33 SATELLITE
A study of geomagnetic storms
[NASA-CR-142800] N75-24208
EXPLORER 35 SATELLITE
A study of geomagnetic storms
[NASA-CR-142800] N75-24208
EXPLORER 40 SATELLITE
Electron precipitation in the post midnight sector of the auroral zones --- on the Explorer 40 satellite
[NASA-CR-142812] N75-24209
EXPLORER 49 SATELLITE
Analysis of RAE-B attitude data
[NASA-CR-143793] N75-23632
EXPLOSIVES
Minutes of the 16th Explosives Safety Seminar, volume 1 --- including ammunition and propellant storability
[AD-A007557] N75-23801
Minutes of the 16th Explosives Safety Seminar, volume 2 --- including ammunition and propellant storability
[AD-A007566] N75-23802
EXTRATERRESTRIAL RADIO WAVES
Jupiter: As a planet --- its physical characteristics and radio waves emitted from Jupiter
[NASA-TM-X-66828] N75-24632
EXTRAVEHICULAR ACTIVITY
Phase 1 engineering and technical data report for the thermal control extravehicular life support system
[NASA-CR-141793] N75-24360
EXTREMELY HIGH FREQUENCIES
New observations of H2 regions at 7.875, 15.5, 31.4, or 85 GHz
N75-24569
EXTRUDING
Structure and properties of steels theromomechanically processed by impact extrusion
[AEC-IS-T-652] N75-23746
EYE [ANATOMY]
Quantitation of microwave radiation effects on the eyes of rabbits at 2450 MHz and 918 MHz
[AD-A007521] N75-24344
Measurement of absorbed power patterns in the head and eyes of rabbits exposed with typical microwave sources
[AD-A007524] N75-24346

F

F REGION
Ionospheric research --- E region, F region, D region
[NASA-CR-142830] N75-24210
FACTORIALS
Methods for computing and modifying the LDV factors of a matrix
[NPL-NAC-56] N75-24421
FAILURE ANALYSIS
Combined stress effects upon failure of fiber composites --- carbon fiber reinforced plastics and boron reinforced materials
[AD-A007352] N75-23716
Failure analysis of electronic parts: Laboratory methods --- for destructive and nondestructive testing
[NASA-SP-6508] N75-23853
The background to current theories of scuffing --- a study of boundary lubrication, sliding friction, and elastohydrodynamics
[S/T-MEMO-5/73] N75-23991
Lubrication breakdown under boundary conditions --- sliding friction and a failure analysis
N75-23993
FAILURE MODES
Specialists meeting on Failure Modes of Composite Materials with Organic Matrices and Their Consequences on Design
[AGARD-CP-163] N75-23698
Failure criteria to fracture mode analysis of composite laminates
N75-23700
An experimental study to determine failure envelope of composite materials with tubular specimens under combined loads and comparison between several classical criteria
N75-23701
Practical finite element method of failure prediction for composite material structures
N75-23703
Consideration of failure modes in the design of composite structures
N75-23710
FALLOUT
READY 1 system for the UNIVAC 1108 attack conditions program
[PB-239295/9] N75-24668
FAR FIELDS
The distribution of jet source strength intensity by means of a direct correlation technique --- far and near fields
N75-23872
Laser geodynamic satellite thermal/optical/vibrational analysis and testing, volume 2, book 2 --- cubes and far fields
[NASA-CR-120756] N75-23935
FAR INFRARED RADIATION
The generation of step-tunable far infrared radiation by phase matched difference frequency mixing in planar dielectric waveguides
N75-23963
Wide beam measurements of H2 regions in the infrared
N75-24564
Far infrared photometry of H2 regions --- balloon-borne telescopy
N75-24565
Far infrared observations of W51 and the galactic centre --- balloon-borne telescope system
N75-24566
High-resolution maps of H2 regions at far-infrared wavelengths --- balloon-borne cassegrain telescope
N75-24567
Expected far infrared polarization of H2 regions and the nuclei of galaxies
N75-24579
Multicolour far-infrared photometry of the galactic centre region --- balloon-borne instruments
N75-24586
FAST FOURIER TRANSFORMATIONS
A maximum entropy filter --- a discussion of fast Fourier transformations and signal processing
[AD-A007482] N75-23834
High resolution spectral analysis with arbitrary spectral centers and adjustable spectral resolutions
[AD-A007483] N75-23838
FAST NUCLEAR REACTORS
High temperature ultrasonic transducers for in-sodium service
[HEDL-SA-726] N75-23937
FATIGUE [MATERIALS]
Prediction of static and fatigue damage and crack propagation in composite materials
N75-23699
Program to improve the fracture toughness and fatigue resistance of aluminum sheet and plate for aircraft applications, volume 2
[AD-A003417] N75-23775
Fracture and fatigue crack growth behavior of surface flaws and flaws originating at fastener holes. Volume 2: Tabulated data
[AD-A003416] N75-23776
A new model for the threshold condition for initiation and propagation of fatigue cracks
N75-24025
CGR: An improved computerized model to predict fatigue crack growth under spectrum loading
[AD-A007481] N75-24043
FATIGUE LIFE
An investigation of the effect of shot peening on the rotating bending fatigue endurance of chromium plated 18% Ni maraging steel
[AQD/U-000667] N75-23773
FATIGUE TESTS
Corrosion fatigue of type 304 stainless steel in H2SO4 + NaCl at 25 C
N75-23748
Study on the behavior of layered glass-resin under dynamic load [fatigue]
N75-24030
Fatigue properties of aircraft lugs with interference fit
[TAE-243] N75-24031
FEDERAL BUDGETS
Energy imports and the US balance of payments
[GPO-28-965] N75-24114
Department of Housing and Urban Development-independent agencies appropriations for 1976. Part 2: National Aeronautics and Space Administration
[GPO-51-423] N75-24542
FEEDBACK CONTROL
Linearization of FM-CW radar sweep by feedback
[AD-A007867] N75-23551
FERRIMAGNETS
Computing programme for a two sublattice neel ferrimagnet, application to the rareearth compounds
[IFA-SR-9-1974] N75-23770
FERROELECTRICITY
Nonlinear conversion of ferroelectric energy and energy conversion by forced transition with Pb[Zr sub [1-x]Ti sub x]O3 ceramics
N75-23805
SbSI physical properties near the ferroelectric phase change point
N75-24501
FERROMAGNETIC MATERIALS
Low temperature calorimetry of transition metal alloys --- alloys of ferromagnetic metals with titanium
N75-24492

FERROMAGNETISM
Low temperature magnetization for Heisenberg ferromagnet
[JINR-P4-8032] N75-24432
High field susceptibility in ferromagnetic NpOs2
[CONF-741057-3] N75-24510
FIBER OPTICS
Integrated optical circuit devices
[AD-A007512] N75-24471
FIBER STRENGTH
Anelastic deformation of boron fibers --- vapor deposited fibers
[NASA-TM-X-71710] N75-23697
Fracture behaviour and residual strength of carbon fibre composites subjected to impact loads
N75-23706
FIELD EFFECT TRANSISTORS
Performance improvement of a field effect transistor with Schottky barrier on GaAs
[MB/DL-CRL-32/43] N75-24500
FIELD THEORY [ALGEBRA]
Computer analysis of multicircuit shells of revolution by the field method
[NASA-CR-2535] N75-24037
FIGHTER AIRCRAFT
A criterion for prediction of airframe integration effects on inlet stability with application to advanced fighter aircraft
N75-23487
Emergency ejection, sequence of operation
[AD-A007470] N75-23539
Design and analysis of a supersonic penetration/maneuvering fighter
[NASA-CR-132633] N75-23558
Parametric analysis of an advanced manned interceptor utilization
[AD-A007663] N75-23563
Aerospace Defense Command Weapon System Evaluation Program plan [WSEP]
[AD-A007690] N75-24665
FILM THICKNESS
Development of a nonpenetrating inductance probe for measuring lubricating film thickness in a dynamic seal --- using computer programs
N75-23912
Generalized characteristics of electrical conductance film thickness gauges
[PB-238949/2] N75-23958
Liquid film thickness measurement: Design and use of a conductance probe
[PB-238950/0] N75-23959
Elastohydrodynamic lubrication in line contact --- gears and film thickness
N75-23992
Critical current density in superconducting niobium films
[CONF-740957-21] N75-24509
FILMS
Morphological growth of sputtered MoS2 films
[NASA-TM-X-71742] N75-24507
FILTRATION
Non-destructive test of charcoal filters. Part 3: Characteristics of the elution peaks of ethane and propane on partially spent charcoal filters of various moisture contents
[TDCK-65348] N75-24168
FINITE DIFFERENCE THEORY
Explicit finite-difference diagram for the solution of the problem of flow by about the establishment --- gas dynamics
[AD-A007410] N75-23902
Finite difference methods for transient signal propagation in stratified dispersive media
N75-24427
FINITE ELEMENT METHOD
A finite-element method for lifting surfaces in steady incompressible subsonic flow
[NASA-CR-142811] N75-23477
Subsonic and supersonic indicial aerodynamics and aerodynamic transfer function for complex configurations --- aerodynamic configurations for subsonic and supersonic speeds using the finite element method
[NASA-CR-142818] N75-23478
Calculation of the reinforced thin-walled construction by the method of the final element
[AD-A007307] N75-23560
Practical finite element method of failure prediction for composite material structures
N75-23703
A finite element formulation for supersonic flows around complex configurations
[NASA-CR-142819] N75-23887
A finite element displacement approach for the elasto-plastic analysis of thin cylindrical shells
N75-24023
A finite element analysis of bodies of revolution. A comparison between currently used types of elements
[CRIF-MT-102] N75-24422
FIRE EXTINGUISHERS
Problems in combustion and extinguishment --- flame propagation
[TT-71-58001] N75-23737
FIRES
Aircraft engine nacelle fire test simulator
[AD-A007853] N75-23617
FLAME PROPAGATION
Flame spreading on horizontal and vertical fuel surfaces --- flame propagation fuel flow burning rate and surface energy of thermoplastic resins
N75-23723
Problems in combustion and extinguishment --- flame propagation
[TT-71-58001] N75-23737
FLAMES
Sodium sulfate: Vaporization thermodynamics and role in corrosive flames
[NASA-TM-X-71641] N75-23752
FLAPS [CONTROL SURFACES]
Calculation of static longitudinal aerodynamic characteristics of STOL aircraft with upper surface blown flaps
[NASA-CR-137646] N75-23483
Full scale upper surface blown flap noise
[NASA-TM-X-71708] N75-23569
FLASH LAMPS
Output energy optimization of a dye laser --- for intense flashlamp excitation, noting detrimental ultrasonic wave effect
N75-23807
FLAT PLATES
Vibration analysis of skewed cantilever systems: Helicoidal shells and plates
N75-24026
FLEXIBILITY
Method of the optimization of the load-carrying structure of wing on rigidity during variation by the distribution of thickness ratio
[AD-A007317] N75-23521
FLIGHT CHARACTERISTICS
Encounter with Jupiter --- Pioneer 10 space probe
[NASA-TM-X-66831] N75-24635
Pioneer 11 encounter --- with Jupiter
[NASA-TM-X-66833] N75-24637
FLIGHT CONTROL
Manual control in target tracking tasks as a function of controller characteristics: A flight stimulator investigation, phase 2
[AD-A007384] N75-24368
FLIGHT FITNESS
Medical requirements and examination procedures in relation to the tasks of today's aircrew: Comparison of examination techniques in neurology, psychiatry and psychology with special emphasis on objective methods and assessment criteria
[AGARD-CP-153] N75-24297
Flight fitness and psycho-physiological behavior of applicant pilots in the first flight missions
N75-24304
Psychic health: A quantite negligeable in flying fitness examinations
N75-24308
FLIGHT INSTRUMENTS
Advanced technical evaluation of a master monitor display
[AD-A007699] N75-23566
FLIGHT MECHANICS
Essentials of the theory of flight and elements of designing artificial earth satellites
[NASA-TT-F-16220] N75-23637
FLIGHT PATHS
Analysis of distress air cases in relation to crash position and intended track: 1968 - 1973
[AD-A007429] N75-23540
Four-dimensional guidance algorithms for aircraft in an air traffic control environment
[NASA-TN-D-7829] N75-23549
FLIGHT SIMULATION
An experimental study of jet exhaust simulation
N75-23501
Contribution of flight simulation tests to the study of turbomachine control
N75-23577
A pilot/LSO simulation conducted to investigate aircraft wave-off performance and to determine the ability of the landing signal officer to judge aircraft approaches
[AD-A007515] N75-24356
Manual control in target tracking tasks as a function of controller characteristics: A flight stimulator investigation, phase 2
[AD-A007384] N75-24368
FLIGHT STRESS
Laboratory assessment of pilot performance using nonrated subjects at three alcohol dose levels
[AD-A007727] N75-24349
FLIGHT TESTS
Analysis of wake vortex flight test data behind a T-33 aircraft
[NASA-CR-137669] N75-23482
Isolating nozzle afterbody interaction parameters and size effects: A new approach --- flight and wind tunnel tests with A 7 aircraft
N75-23503
Reynolds number effects on boattail drag of exhaust nozzles from wind tunnel and flight tests
N75-23506
Flight test for the feasibility evaluation of the Chadwick Electronic Weighing System [CHEWS]
[AD-A007516] N75-23522
Correlation of low speed wind tunnel and flight test data for V/STOL aircraft
[NASA-TM-X-62423] N75-23557
Comparison of flight measurements with predictions from aeroelastic models in the NASA Langley Transonic Dynamics Tunnel
[NASA-TM-X-72686] N75-23610
Air Force Flight Test Center technology needs. Annual report for calendar year 1974
[AD-A007840] N75-23616
Laboratory and flight results of the microstrip plasma probe --- blackout [propagation] and plasma sheaths
[AD-A007685] N75-23947
FLIGHT TRAINING
Administration of the Rorschach tests to a sample of student pilots training apprenticeship
N75-24299
Impact of multivariate analysis on the aviation selection and classification process
N75-24306
Visual and auditory information processing aspects of the acquisition of flying skill
[AD-A007721] N75-24358
FLOATING POINT ARITHMETIC
Microprocessors in computing --- floating point arithmetic
[UCRL-76234] N75-24385
FLOOD PREDICTIONS
River forecasts provided by the National Weather Service. Volume 2: 1973
[COM-75-50005/8] N75-24243
FLOW DISTRIBUTION
Airframe/propulsion system flow field interference and the effect on air intake and exhaust nozzle performance
N75-23508
Experimental study of model size effects on cavitation and ventilation of surface piercing struts --- hydrofoil craft
[AD-A006672] N75-23896
Problems relating to wind tunnel simulation of relaxing flows
[AD-A007406] N75-23900
Flows with lambda-shaped shocks at the entrance into plane supersonic air inlet
[AD-A007458] N75-23907
Studies on measuring ultrasonic flow with the aid of the Doppler effect
[NASA-TT-F-16393] N75-23928
Differential sea ice drift
[AD-A007733] N75-24048
Development of a three-dimensional time-dependent flow field model
[NASA-CR-120762] N75-24070
Mesonetwork array: Its effect on thunderstorm flow resolution --- wind
[COM-75-10248/3] N75-24257
FLOW MEASUREMENT
Cryogenic mass flowmeter development
[AD-A007794] N75-23942
FLOW REGULATORS
Afterburning regulation concepts
N75-23587
FLOW STABILITY
Observations of short period internal waves generated by shear flow instability --- temperature gradients
N75-23871
FLOW THEORY
Theory of mixing flow of a perfect fluid around an afterbody and a propulsive jet
N75-23493
FLOW VELOCITY
Velocity and rolling-moment measurements in the wake of a swept-wing model in the 40 by 80 foot wind tunnel
[NASA-TM-X-62414] N75-23481
FLOWMETERS
Studies on measuring ultrasonic flow with the aid of the Doppler effect
[NASA-TT-F-16393] N75-23928
Cryogenic mass flowmeter development
[AD-A007794] N75-23942
Evaluation of the Expendable Surface Current Probe [ESCP]
[AD-A007877] N75-23943
FLUID DYNAMICS
Some results of the hydrodynamic theory of finite-amplitude waves
N75-24275
FLUID FLOW
Flow of a particulate suspension in the wake of a circular cylinder
N75-23471
Analysis of fluid flow in the entrance region of a duct with an eccentric annular cross-section
N75-23472
KACHINA: An eulerian computer program for multifield fluid flows
[LA-5680] N75-23893
FLUID MECHANICS
Analysis of Skylab fluid mechanics science demonstrations
[NASA-CR-120765] N75-23888

FLUID ROTOR GYROSCOPES
Hydrostatic fluid bearing gyro --- temperature control
[NASA-CR-120753] N75-23931
FLUIDIC CIRCUITS
Fluidic sensors for turbojet engines
N75-23598
FLUIDIZED BED PROCESSORS
Coal processing by electrofluidics
[PB-238973/2] N75-23741
Fluidized bed regenerators for Brayton cycles
[NASA-TM-X-71736] N75-23891
FLUORESCENCE
An automated molecular fluorescence/absorption sequential analyzer with laser source
N75-23911
FLUORIDES
Graphite fluoride lubrication: The effect of fluorine content, atmosphere, and burnishing technique
[NASA-TM-X-71733] N75-23988
FLUORINATION
Effect of electron irradiation in vacuum on FEP-A silicon solar cell covers
[NASA-TM-X-71713] N75-23668
FLUOROSILICATES
Determination of fluoride in fluomica and fluomica-alumina composites with the fluoride electrode
[AD-A007764] N75-23736
FLUTTER
Some problems of modelling aeroelastic phenomena in a transonic tunnel
[AD-A007391] N75-23561
FLUX [RATE]
An analysis of imperfections in DMSP photographs caused by high energy solar and trapped protons
[AD-A007679] N75-24249
FOCUSING
Caustic matching: A new technique for improving limited-scan antennas
[AD-A007665] N75-23831
FORECASTING
Saint Louis aviation forecast study: Technical supplement --- ground access analysis data
[PB-239058/1] N75-23535
Saint Louis aviation forecast study: Review of prior forecasts
[PB-239057/3] N75-23536
Saint Louis aviation forecast study
[PB-239056/5] N75-23537
Saint Louis aviation forecast study: Executive summary
[PB-239055/7] N75-23538
FOREIGN BODIES
Third body formation and elimination on carbon fiber epoxy composite --- effects on friction and wear
N75-24004
FOREIGN POLICY
Energy imports and the US balance of payments
[GPO-28-965] N75-24114
Energy and foreign policy
[GPO-22-562] N75-24125
FORTRAN
FORTRAN program for calculating the trajectory of projectiles
[NASA-TT-F-16316] N75-23634
SAAM25, simulation, modeling and data fitting program. User's guide --- FORTRAN and bionics
[PB-238368/5] N75-24400
Optimal Synthesis Program for Automatic Control [OSPAC] --- in FORTRAN
[AD-A007550] N75-24416
READY 1 system for the UNIVAC 1108 weapons effect program
[PB-239293/4] N75-24666
FOSSIL FUELS
Technology and use of lignite
[PB-238666/2] N75-24131
FOURIER TRANSFORMATION
Employment of the fast Fourier transform in digital filters
[RAE-LIB-TRANS-1834] N75-24384
The approximation of correlation functions --- using Fourier transformation
[AD-A007664] N75-24423
FRACTURE MECHANICS
Fracture behaviour and residual strength of carbon fibre composites subjected to impact loads
N75-23706
Optical methods for testing composite materials --- stress analysis and fracture mechanics
N75-23707
Material characterization of the fracture of filament, reinforced composites --- including carbon and glass fiber reinforced plastics
[AD-A007386] N75-23717
Non-linear fracture mechanics: New theories of solid propellant response and fracture behaviors
[AD-A007334] N75-23800
Report of NRL progress --- including fracture mechanics, plasma physics, underwater acoustics, and radio communication
[PB-238901/3] N75-24663
FRACTURE STRENGTH
Failure criteria to fracture mode analysis of composite laminates
N75-23700
Fracture toughness of bridge steels, phase 2 report
[PB-239188/6] N75-23774
Program to improve the fracture toughness and fatigue resistance of aluminum sheet and plate for aircraft applications, volume 2
[AD-A003417] N75-23775
FRACTURES [MATERIALS]
Fracture mechanics of metallic structures
N75-24028
FRAGMENTATION
Star formation and contraction/fragmentation problems
N75-24583
FRAMES
Invariant dynamics of flight vehicles under rotating reference frames
[AD-A007671] N75-23642
FRANCE
Multispectral aerial reconnaissance of parasitic attacks in forests: Remote sensing --- in France
N75-24052
Construction of a monolingual thesaurus on atmospheric pollution --- French language
N75-24531
FREE FLOW
Effects of geometric variables on the performance of a probe for direct measurement of free-steam stagnation pressure in supersonic flow
[NASA-TN-D-7887] N75-23470
Unsteady stall of a slender elliptic cylinder in a freestream of sinusoidally varying angle of incidence
N75-23473
A study of reacting free and ducted hydrogen/air jets
[NASA-TM-X-72678] N75-23571
FREE MOLECULAR FLOW
Nonstationary heat exchange in a free molecular range --- rarefied gas dynamics and one dimensional flow
N75-23870
Spherical cavity in a free molecular flow --- numerical analysis using the Monte Carlo method
[AD-A007290] N75-23899
FREEZING
Irrigation scheduling, freeze warning and soil salinity detecting --- in Cameron County Texas
[E75-10285] N75-24058
FREQUENCY CONVERTERS
Principles for the construction of polarization converters and modulators, chapter 3 --- including phase shifters and modulation
N75-23824
FRICTION
A testrig to measure the thermal conductance and friction torque of bearings in vacuum
N75-24001
FRICTION MEASUREMENT
The friction and wear of self lubricating polythenes
N75-23998
Friction of the couples copper-copper, molybdenum-molybdenum, copper-molybdenum and copper-nickel in the ultrahigh vacuum
N75-24002
FROST
Infrared spectroscopy of Comet Kohoutek --- and reflection studies of frost spectra
[NASA-CR-142809] N75-24597
FUEL COMBUSTION
The oxidation of ethylene in automotive engine exhaust gas; an experimental investigation
N75-23719
As asymptotic ignition theory of porous solid fuels [thermo-diffusive theory] --- differential equations for the ignition of coal
N75-23798
FUEL CONSUMPTION
Alcohol assisted hydrocarbon fuels: A comparison of exhaust emissions, power output and fuel consumption using static and dynamic engine test facilities
N75-24012
Industrial energy study of the drug manufacturing industries for the Federal Energy Administration/US Department of Commerce
[PB-238994/8] N75-24130
Energy system modeling-interfuel competition
[PB-239292/6] N75-24140
The impact of energy shortages on the iron and steel industries
[PB-238749/6] N75-24158
FUEL CONTROL
Engine control for harpoon missile system
N75-23580
FUEL FLOW
Flame spreading on horizontal and vertical fuel surfaces --- flame propagation fuel flow burning rate and surface energy of thermoplastic resins
N75-23723
FUEL FLOW REGULATORS
A digital controller applied to the limitation of reheat combustion roughness
N75-23586
A new lightweight fuel control system for electrical inputs --- considering gas turbine engines
N75-23599
FUEL PUMPS
Pumping system design related to fuel system specifications
N75-23600
Advanced engine mounted fuel pump technology
N75-23601
FUELS
Where the boilers are: A survey of electric utility boilers with potential capacity for burning solid waste as fuel
[PB-239392/4] N75-24135
Symposium proceedings: Environmental Aspects of Fuel Conversion Technology
[PB-238304/0] N75-24179
FUNCTIONAL ANALYSIS
The D sub m[kappa, alpha 1..., alpha sub m function in the ocean-continent transfer problem
N75-24269
Some new methods of determining and studying the absorptivity of a medium and the generalized angular coefficients of radiation
N75-24274
FURNACES
Heat recovery systems for industrial furnaces, particularly coke ovens
[NASA-TT-F-16400] N75-23889
FUSELAGES
Detailed experimental and theoretical analysis of the aerodynamic interference between lifting jets and the fuselage and wing
N75-23509

G

GALACTIC EVOLUTION
OH and the earliest evolution of H2 regions
N75-24573
Evolutionary characteristics of a bimodal grain model --- interstellar grains
N75-24576
GALACTIC NUCLEI
H2 regions and the galactic centre
[ESRO-SP-105] N75-24555
Nuclei and H2 regions in spiral galaxies: Preliminary results for M 101
N75-24575
Expected far infrared polarization of H2 regions and the nuclei of galaxies
N75-24579
Recent radio observations of the galactic centre
N75-24588
Observations of neutral hydrogen in the region 355 deg greater than l sup II greater than 10 deg and -5 deg greater than b sup II greater than 5 deg --- galactic radio astronomy
N75-24589
Intense sub-arcsecond structure in the galactic center --- radio sources
N75-24590
Expected infrared molecular lines from the galactic centre
N75-24591
GALACTIC RADIATION
Carbon monoxide mapping of 100 micrometer sources associated with dark clouds: Preliminary results
N75-24582
GALACTIC STRUCTURE
H2 regions and the galactic centre
[ESRO-SP-105] N75-24555
The Orion nebula: A photographic study of spatial structure
N75-24556
On the structure of M17S --- behavior of 9.7 micron band due to dust particles
N75-24563
Far infrared observations of W51 and the galactic centre --- balloon-borne telescope system
N75-24566
An empirical model for the structure of the Orion nebula
N75-24574
Dust in the galactic center --- 9.7 micron band analysis
N75-24584
The dominant 10 to 20 micrometer source in the galactic centre
N75-24585
Multicolour far-infrared photometry of the galactic centre region --- balloon-borne instruments
N75-24586
Infrared radiation model for the galactic centre --- interstellar dust heated by stellar radiation
N75-24587
Recent radio observations of the galactic centre
N75-24588
Intense sub-arcsecond structure in the galactic center --- radio sources
N75-24590
Galactic structure at l 2 equals 40 deg --- noting OB star distribution due to occultation by galactic dust
[SBN-902553-11-9] N75-24609

GALLIUM ALLOYS
Studies on immiscible alloys --- the processing of gallium-bismuth in a low-gravity environment
[NASA-CR-120764] N75-23759

GALLIUM ARSENIDES
Time development of ultrashort pulse generation from a Nd:glass laser with a saturable dye and short laser pulse damage of GaAs and ZnTe at 1.06 microns
N75-23964
Performance improvement of a field effect transistor with Schottky barrier on GaAs
[MB/DL-CRL-32/43] N75-24500
Ion implantation of diatomic sulfur into GaAs
[AD-A006801] N75-24514

GALVANOMAGNETIC EFFECTS
Investigation of the galvanomagnetic properties of graphite in magnetic fields up to 500 kOe at low temperatures --- the Hall effect and electrical resistance
[NASA-TT-F-16387] N75-23787

GAME THEORY
Use of macros in backtrack programming
[PB-238644/9] N75-24386

GAMMA RAYS
Solar gamma ray monitor for OSO-H [0.3-10 MeV]
[NASA-CR-143799] N75-23922
On the question of induced Mossbauer gamma radiation --- laser applications
N75-23966
Questions of the kinetics of stimulated gamma radiation --- resonant frequencies and the Mossbauer effect
N75-23967
The influence of ionizing radiation on the immune response
[MBL-1974-28] N75-24329
General safety standard,for installations using nonmedical X-ray and sealed gamma-ray sources, energies up to 10 MeV
[COM-75-50166/8] N75-24353
Solar gamma-ray lines as probes of accelerated particle directionalities in flares
[NASA-TM-X-70890] N75-24646

GANGLIA
The innervation of chick striated muscle fibres by the chick ciliary ganglion in tissue culture
[MBL-1974-33] N75-24338

GAS ANALYSIS
Project Rio Blanco: Project scientist's summary report of production test data and preliminary analysis of top chimney/cavity --- gas and radioactive analysis
[UCRL-76280] N75-24452

GAS COOLED FAST REACTORS
Study of the application of HTGR to a petroleum refinery petrochemical complex
[CONF-741144-1] N75-24126

GAS DETECTORS
Infrared gas filter correlation instrument for in-situ measurement of gaseous pollutants
[PB-239467/4] N75-23956

GAS DISCHARGES
Characterization of unsteady gas discharge from a vessel --- through orifice to atmosphere
[SAND-75-8207] N75-23892

GAS DYNAMICS
Explicit finite-difference diagram for the solution of the problem of flow by about the establishment --- gas dynamics
[AD-A007410] N75-23902
Effect of nonequilibrium processes on the gas-dynamic parameters in hypersonic installations and in the critical point of a blunted body
[AD-A007414] N75-23904

GAS FLOW
Flow of rarefied gas between two parallel plates
[AD-A007303] N75-23898
Exact solutions of the equations of Navier-Stokes for the flow of the compressible gas in channels
[AD-A007683] N75-23908

GAS GENERATORS
Hydrazine gas generator program --- space shuttles
[NASA-CR-141795] N75-23680
System evaluation of solid chemical oxygen generators --- using sodium chlorate candles
[AD-A007691] N75-23690

GAS IONIZATION
Ionisation structure and transfer of radiation in dusty nebulae
N75-24578

GAS LASERS
On the relative merits of using either CW helium-cadmium or pulsed nitrogen lasers as the flourescence excitation source in airborne laser flourosensing systems
[PB-238845/2] N75-23974
New laser oscillation in the oxygen atom
[AD-A007780] N75-23977
Parameters of the pulsed phosphorus laser system
[AD-A007694] N75-23982

GAS TURBINE ENGINES
Power plant controls for aero-gas turbine engines
[AGARD-CP-151] N75-23575
Aerothermodynamic factors governing the response rate of gas turbines
N75-23576
Reliability specification for gas turbine control systems
N75-23581
The role of computers in future propulsion controls
N75-23582
PRAC: A new aero gas turbine engine control concept
N75-23584
Helicopter engine control: The past 20 years and the next
N75-23585
Afterburning regulation concepts
N75-23587
Equilibrium performance analysis of gas turbine engines using influence coefficient techniques
N75-23592
Generalized dynamic engine simulation techniques for the digital computers
N75-23593
Total powerplant simulation
N75-23594
Use of simulation in the design, development and testing of power plant control systems
N75-23595
Temperature measurement for advanced gas turbine controls
N75-23597
Fluidic sensors for turbojet engines
N75-23598
A new lightweight fuel control system for electrical inputs --- considering gas turbine engines
N75-23599
Pumping system design related to fuel system specifications
N75-23600
Advanced engine mounted fuel pump technology
N75-23601
Aerodynamic design of a free power turbine for a 75 KW gas turbine automotive engine
[NASA-TM-X-71714] N75-24106
A compressor designed for the energy research and development agency automotive gas turbine program
[NASA-TM-X-71719] N75-24116

GASES
The dynamics of adsorption of vapours by porous adsorbents in fixed beds. [Breakthrough curves of sarin on charcoal in the very low concentration region]
[TDCK-65300] N75-24167

GASOLINE
Development of a bench procedure for evaluating the effectiveness of dispersant detergent gasoline additives, phase 2
[AD-A006580] N75-24018

GATES [CIRCUITS]
NOR network transduction procedures: Merging of gates and substitution of gates for fan-in and fan-out restricted networks [NETTRA-G3-FIFO and NETTRA-PG1-FIFO]
[PB-238944/3] N75-24401

GEARS
Elastohydrodynamic lubrication in line contact --- gears and film thickness
N75-23992
Presentation of tests on gears performed at CNES
N75-24015

GEIGER COUNTERS
Production engineering measure for high range Geiger Mueller tube --- using surface finishing
[AD-A007258] N75-23944

GEMINI PROJECT
History of manned space flight
[NASA-TM-X-66817] N75-24641

GENETIC CODE
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 2: Studies on the specificity of initiation of transcription
[MBL-1975-5] N75-24312
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 3: Evidence for positive control of transcription
[MBL-1975-6] N75-24313
Transcription of bacteriophage Mu: An analysis of the transcription pattern in the early phase of development
[MBL-1974-36] N75-24341

GEODETIC SURVEYS
Calibration and evaluation of Skylab altimetry for geodetic determination of the geoid
[E75-10282] N75-24055
Theory and practice of geophysical survey design --- track-type geophysical surveys and algorithms applied to sampling problems
N75-24203

GEOIDS
Calibration and evaluation of Skylab altimetry for geodetic determination of the geoid
[E75-10282] N75-24055

GEOLOGICAL FAULTS
Fault tectonics and earthquake hazards in the Peninsular Ranges, Southern California --- Mojave Desert
[E75-10284] N75-24057
Identification and interpretation of tectonic features from Skylab imagery --- Mojave Desert and San Bernardino Mountains, California
[E75-10288] N75-24061
Seismic properties of the Mohorovicic discontinuity
[TT-74-50029] N75-24219

GEOMORPHOLOGY
Results of geologo-morphological analysis of some photographs of the Martian surface obtained by the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16343] N75-24622

GEOPHYSICAL OBSERVATORIES
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Jul. - Sep. 1974
[REPT-74/7-9] N75-24214
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Oct. - Dec. 1974
[REPT-74/10-12] N75-24215

GEOPHYSICS
Information devices and systems in prospecting geophysics
[AD-A007408] N75-24653
Soviet bloc research in geophysics, astronomy, and space, no. 348
[JPRS-64770] N75-24662

GERMANIUM
Studies of the effects of radiations
[COO-125-57] N75-24449
The effects of topology on the properties of random network models for amorphous Group 4 semiconductors --- germanium, silicon, and energy bands
N75-24495

GERT
Graphics of space mechanics analytical-graphical methods in space navigation
[NASA-TT-F-16298] N75-23636

GIMBALS
A steering law for three double-gimbal control moment gyro systems
[NASA-TM-X-64926] N75-23925

GLASS
Nuclear magnetic resonance studies of glasses and related crystalline materials
N75-23784
Absorption and luminescence of glasses during electron irradiation
[BNL-19348] N75-23790
Concerning the nature of rubber glass: Transition of elastomeric materials
[AD-A007348] N75-23796
Study on the behavior of layered glass-resin under dynamic load [fatigue]
N75-24030
DT fusion neutron irradiation of ORNL magnesium oxide crystal, BPNL molybdenum, LLL copper tensile specimens, LLL machinable glass ceramic, and UW/LLL high purity metallic foils
[UCID-16665] N75-24443
Morphological growth of sputtered MoS2 films
[NASA-TM-X-71742] N75-24507

GLASS FIBER REINFORCED PLASTICS
Material characterization of the fracture of filament, reinforced composites --- including carbon and glass fiber reinforced plastics
[AD-A007386] N75-23717

GLASS FIBERS
Study of fiber reinforcement of thermoplastic polymers
N75-23695
Influence of fabrication parameters on the rupture of glass fiber reinforced plastics
N75-23704

GLOBAL AIR POLLUTION
Radioisotopes and global transport in the atmosphere
[TT-74-50025] N75-24190

GLOW DISCHARGES
A study of glow discharge polymerization as a means of modifying the surface of polymers
[PB-239289/2] N75-23797

GLUCOSE
Effects of muscular exercise on variation in plasma cortisol and glucose in normal males
[NASA-TT-F-16257] N75-24326

GOLD
Reliability study of microwave power transistors
[AD-A007788] N75-23863

GONDOLAS
Astronomy at sub-millimeter wavelengths --- using telescopes mounted on gondolas
[NASA-CR-142814] N75-23927

GRAINS
Evolutionary characteristics of a bimodal grain model --- interstellar grains
N75-24576

GRAPHITE
Mechanical properties of aluminum alloy-graphite fiber composites --- metal matrix composites
[AD-A007779] N75-23715
Investigation of the galvanomagnetic properties of graphite in magnetic fields up to 500 kOe at low temperatures --- the Hall effect and electrical resistance
[NASA-TT-F-16387] N75-23787

GRAPHS [CHARTS]
Using blossoms to find maximum matchings on graphs
[PB-238971/6] N75-24377
GRAVITATION
Direct recovery of mean gravity anomalies from satellite to satellite tracking
N75-24201
GRAVITATION THEORY
Time dependent accretion disks around compact objects, part 1. Theoretical frameworks for analyzing and testing gravitation theories, part 2
N75-24604
GRAVITATIONAL EFFECTS
Collection of problems on the dynamics of a point in a central force field
[NASA-TT-F-16263] N75-23633
GRAVITATIONAL FIELDS
Collection of problems on the dynamics of a point in a central force field
[NASA-TT-F-16263] N75-23633
Gravity fields of the solar system
[NASA-SP-8117] N75-24608
GREASES
Grease lubricated spiral groove bearings for long-life systems --- communication satellite momentum wheel
N75-24003
GREAT SALT LAKE (UT)
Experimental evaluation of atmospheric effects on radiometric measurements using the EREP of Skylab --- Salt Lake Desert
[E75-10283] N75-24056
GRINDING [MATERIAL REMOVAL]
Investigation of contact between ground surfaces through continuous time series model
N75-24027
GROUND EFFECT
Ground effects for jet lift VTOL
[NASA-TT-F-16359] N75-23480
GROUND EFFECT MACHINES
Studies and research on marine hulls working with natural ground effect
N75-23475
Wing longitudinal stability criteria
[AD-A007430] N75-23527
Hydroaerodynamic characteristics of a low aspect ratio delta wing near a screen
[AD-A007649] N75-23529
GROUND SUPPORT EQUIPMENT
Repair dock for large aircraft
[AD-A007399] N75-23613
GROUND TRUTH
Ground truth procedures, Phoenix soil moisture
[NASA-CR-143795] N75-24066
GROUND-AIR-GROUND COMMUNICATIONS
Experiment definition phase shuttle laboratory LDRL-10.6 experiment --- using a molniya satellite and ground communication links
[NASA-CR-143746] N75-23652
GUIDANCE SENSORS
Study of a porous surface microphone sensor in an aerofoil --- air flow
[NASA-CR-137652] N75-23932

H

HADRONS
Leptons production in hadronic collisions, partons, vector mesons and new particles
[PM/75/3] N75-24456
A cloud-chamber search for multiple-cores and high transverse-momenta in cosmic ray air showers --- particle density [concentration]
N75-24650
Multiparticle production in the interactions of charged cosmic ray hadrons with nuclear targets
N75-24651
HALL EFFECT
Anomalous Hall effect in metals with small concentrations of localized magnetic defects
N75-23750
Investigation of the galvanomagnetic properties of graphite in magnetic fields up to 500 kOe at low temperatures --- the Hall effect and electrical resistance
[NASA-TT-F-16387] N75-23787
HAMILTONIAN FUNCTIONS
An accelerated elimination technique for the solution of perturbed Hamiltonian systems --- von Zeipel method
N75-24417
The effect of anisotropy on the piezoelectric polaron --- Hamiltonian functions
N75-24489
HANDICAPS
The lightspot operated typewriter: The evaluation of a prototype
[WTHD-65] N75-24364
HAWAII
Some characteristics of Hawaiian high intensity rainfall
[PB-239398/1] N75-24261
HEAD [ANATOMY]
Measurement of absorbed power patterns in the head and eyes of rabbits exposed with typical microwave sources
[AD-A007524] N75-24346
HEALTH
Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety
[PB-239429/4] N75-24351
Urban environmental health applications of remote sensing, summary report
[NASA-CR-141788] N75-24543
HEALTH PHYSICS
General safety standard for installations using nonmedical X-ray and sealed gamma-ray sources, energies up to 10 MeV
[COM-75-50166/8] N75-24353
HEAO
Si[Li] X-ray astronomical spectroscopy
[NASA-TM-X-70894] N75-23924
HEART
Artificial heart controls support
[ORO-4485-2] N75-24365
HEAT EXCHANGERS
Variations in heat exchanger design for ocean thermal difference power plants
[PB-238572/2] N75-24134
HEAT FLUX
An analytical study of thermal turbulence --- turbulent natural convection induced by heat flux in a layer of fluid
N75-23876
HEAT MEASUREMENT
Low temperature calorimetry of transition metal alloys --- alloys of ferromagnetic metals with titanium
N75-24492
HEAT PIPES
Ames Heat Pipe Experiment [AHPE] experiment description document --- performance testing in a vacuum environment
[NASA-CR-114413] N75-23880
ERTS-C [Landsat 3] cryogenic heat pipe experiment definition
[NASA-CR-143797] N75-23882
Electric power generation utilizing a heat pipe turbine-generator
N75-24096
HEAT RADIATORS
Heat recovery systems for industrial furnaces, particularly coke ovens
[NASA-TT-F-16400] N75-23889
HEAT RESISTANT ALLOYS
Examination of the influence of coatings on thin superalloy sections. Volume 1: Description and analysis
[NASA-CR-134791] N75-23755
Modified ferritic iron alloys with improved high-temperature mechanical properties and oxidation resistance
[NASA-TN-D-7966] N75-23760
Effects of silicon additions on oxidation and mechanical behavior of the nickel-base superalloy B-1900
[NASA-TN-D-7989] N75-23761
HEAT SHIELDING
Evaluation of dispersion strengthened nickel-base alloy heat shields for space shuttle application
[NASA-CR-132615] N75-23667
HEAT SOURCES
Research on Sr heat source and compatibility tests, dissolution rate, and property measurements of SrF2
[BNWL-1845-3] N75-24454
HEAT TRANSFER
Experimental study of heat transfer during flow around uncambered delta wings with blunted edges
[AD-A007316] N75-23524
Analysis of problems in rocket base heat transfer during the aspiration phase
N75-23675
Nonstationary heat exchange in a free molecular range --- rarefied gas dynamics and one dimensional flow
N75-23870
Laminar flow heat transfer in ordinary and augmented tubes
N75-23879
Experimental study of heat transfer in a critical point of sphere in hypersonic low-density flow
[AD-A007407] N75-23901
Temperature field and heat flow in snow cover
[TT-71-51011] N75-24086
Effects of meso-scale and small scale interactions on global climate. Volume 1: Orographic effects on global climate
[AD-A007034] N75-24247
Physics of the sea and atmosphere
[NASA-TT-F-16225] N75-24262
Spectral analysis of the energy exchange at OWS NOVEMBER
[AD-A007484] N75-24286
HEAT TRANSFER COEFFICIENTS
Condensation heat transfer inside horizontal tubes with internal axial fins --- including pressure gradients
N75-23877
Energy exchange at the surface of the western North Atlantic Ocean
[AD-A007296] N75-24285
HEAVY IONS
Void nucleation and growth in heavy ion and electron bombarded pure metals --- considering He influence
[COO-2206-5] N75-23763
HELICOPTER ENGINES
Helicopter engine control: The past 20 years and the next
N75-23585
HELICOPTER WAKES
Prediction of rotor wake induced flow along the rocket trajectories of an Army AH-1G helicopter
[AD-A007878] N75-23528
HELICOPTERS
Flight test for the feasibility evaluation of the Chadwick Electronic Weighing System [CHEWS]
[AD-A007516] N75-23522
A crashworthy armored pilot seat for helicopters
[AD-A007551] N75-23541
A study of helicopter interior noise reduction
[NASA-TM-X-72655] N75-23556
Research on helicopter rotor noise
[AD-A007261] N75-23608
The development of experimental techniques for the study of helicopter rotor noise
[NASA-CR-137684] N75-23611
HELIOS PROJECT
A dry lubrication system for spaceproofed bearings --- Helios despin drives
N75-24008
HELIUM ATOMS
Four particle exchange in solid He-3
[NASA-CR-142801] N75-24503
HELIUM IONS
Determination of electron temperature in a penning discharge by the helium line ratio method
[NASA-TM-X-71677] N75-24478
HELIUM PLASMA
Measurement of several rate coefficients for the He-Ne laser plasma
N75-24472
HELMETS
Advanced helmet mounted sight study program
[AD-A007874] N75-24366
HEMODYNAMIC RESPONSES
Problems of space biology. Volume 26: Statistical analysis of the cardiac rhythm and hemodynamic indices in physiological research
[NASA-TT-F-16196] N75-24324
HEOS B SATELLITE
HEOS 2 plasma observations in the distant polar magnetosphere: The plasma mantle
[MPI-PAE/EXTRATERR-108] N75-24207
HEURISTIC METHODS
Use of macros in backtrack programming
[PB-238644/9] N75-24386
HF LASERS
Calculation of rotational nonequilibrium in a pulsed HF laser
[UCRL-75814] N75-23969
HIGH ENERGY ELECTRONS
Ionization in the track of a high-energy electron in hydrocarbon liquids. Study of positive and negative ion scavenging using nanosecond pulse radiolysis
[IRI-133-74-06] N75-24455
HIGH ENERGY FUELS
Complex metal hydrides: High energy fuel components for solid propellant rocket motors
[AD-A007353] N75-23779
HIGH ENERGY INTERACTIONS
The charge ratio of ultra high energy cosmic ray muons
N75-24649
HIGH PASS FILTERS
A digital algorithm for spectral deconvolution with noise filtering and peak picking: NOFIPP-DECON
[NASA-TM-X-64927] N75-24383
HIGH PRESSURE
An oscillating-cup viscometer for high pressure, high temperature mercury
N75-23916
Densification-mechanism modeling of the pressure-sintering behavior of MgAl2O4
N75-23984
The action of oil additives --- extreme pressure
N75-23994
Nuclear magnetic resonance studies of solid hydrogen under high pressure
N75-24498
Research for preparation of cation-conducting solids by high-pressure synthesis and other methods
[NASA-CR-134836] N75-24504
Shock waves in hydrogen isotopes and their high pressure equation of state
[UCRL-75727] N75-24513
HIGH RESOLUTION
High-resolution maps of H2 regions at far-infrared wavelengths --- balloon-borne cassegrain telescope
N75-24567
High-resolution radio observations of the sources near K3-50
N75-24570

HIGH STRENGTH ALLOYS
Investigation of smooth specimen scc test procedures; variations in environment, specimen size, stressing frame, and stress state --- for high strength aluminum alloys
[NASA-CR-120752] N75-23758
Study of alloy strengthening due to atomic order
[ORO-3935-43] N75-23769
HIGH STRENGTH STEELS
Characteristics of HY-180 and Ti-100 for welded high strength structures
[AD-A006758] N75-23782
HIGH TEMPERATURE
Theory of the high temperature gas corrosion of metals beneath coatings
[TT-74-58010] N75-23781
HIGH TEMPERATURE AIR
Hot air sterilization
[NASA-TT-F-16384] N75-24320
HIGH TEMPERATURE RESEARCH
Elevated temperature morphological stability of metal matrix fiber composites
[ORO-3947-11] N75-23712
An oscillating-cup viscometer for high pressure, high temperature mercury
N75-23916
High temperature ultrasonic transducers for in-sodium service
[HEDL-SA-726] N75-23937
HIGH TEMPERATURE TESTS
High temperature tests of a JP-5 type fuel
[AD-A007662] N75-23603
HIGH VOLTAGES
Preliminary studies for high tension integrated circuits --- including electrical insulation and resistivity
[MDB/MD-3055] N75-23847
Investigation of problems associated with solid encapsulation of high voltage electronic assemblies; also Reynolds connector study
[NASA-CR-142803] N75-23849
Spacecraft high-voltage power supply construction
[NASA-TN-D-7948] N75-23852
HIGHWAYS
Investigation of the analytical stereoplotter AP/C (OP/C phase) in application to highway engineering projects
[PB-238461/8] N75-24091
Highway travel forecasts
[PB-239169/6] N75-24549
HISTORIES
In outer space
[NASA-TT-F-16252] N75-23625
HOLOGRAPHY
Development of holographic interferometric applications in the VKF supersonic and hypersonic wind tunnels
[AD-A007689] N75-23615
Holographic recording materials development --- using stilbene, indigo, and thioindigo derivatives
[NASA-CR-132672] N75-23930
Nondestructive holographic techniques for structures inspection
[AD-A007850] N75-23946
Holographic stereogram conversion program
[AD-A007786] N75-23952
Thermal loading in the laser holography nondestructive testing of a composite structure
[NASA-TR-R-439] N75-24035
HONEST JOHN ROCKET VEHICLE
The 03702 Honest John Missile No. 1005, round no. 645 AML
[AD-A007462] N75-24254
HOT ELECTRONS
Ignition of military fuels by hot particles
[AD-A007728] N75-23803
HUMAN BODY
Prediction of physiological respones to work, environment and clothing
[AD-A007282] N75-24348
HUMAN FACTORS ENGINEERING
Aerodrome air traffic control in the Canadian Forces --- design of tower cabs for air traffic controller tasks
[DCIEM-74-R-1067] N75-24363
Advanced helmet mounted sight study program
[AD-A007874] N75-24366
HUMAN PERFORMANCE
Real time display parameters study 2
[AD-A007790] N75-24367
HUMAN REACTIONS
Pulse wave velocity over the vascular wall as a means for distinguishing between different psychophysiological reaction patterns to a mental task
N75-24302
Predictive validities of several clinical color vision tests for aviation signal light gun performance
[AD-A606792] N75-24317
Human temporary threshold shift and recovery from 24 hour acoustic exposures
[AD-A007842] N75-24350
Psychophysical tests of potential design/certification criteria for advanced supersonic aircraft --- human noise tolerance
[AD-A009296] N75-24354
HUNGARY
Achievements and tasks of solid-state research in Hungary
N75-24658
HYBRID COMPUTERS
Some fast analytical techniques for the EEG --- using probability distribution function and hybrid computers
N75-24305
HYDRAULIC ANALOGIES
Simulated snowdrift patterns: Evaluation of geometric modeling criteria for a three dimensional structure
[AD-A007735] N75-24050
HYDRAULIC JETS
An experimental study of the surface effect on a bouyant jet
[PB-239536/6] N75-23897
An experimental photographic investigation of vapor bubble collapse and liquid jet impingement
[PB-239019/3] N75-23909
HYDRAULICS
Hydraulic and flow studies related to sediment transport, Kentucky River, Kentucky
[PB-239259/5] N75-24092
HYDRAZINES
Hydrazine gas generator program --- space shuttles
[NASA-CR-141795] N75-23680
HYDRIDES
Observations of phases and volume changes during precipitation of hydride in zirconium alloys
[AE-499] N75-23762
HYDROCARBON FUELS
Alcohol assisted hydrocarbon fuels: A comparison of exhaust emissions, power output and fuel consumption using static and dynamic engine test facilities
N75-24012
HYDROCARBONS
The direct production of hydrocarbons from coal-steam systems
[PB-239356/9] N75-23740
Low-temperature evolution of hydrocarbon gases from coal
[PB-238322/2] N75-24074
Marine pollution monitoring (petroleum): Proceedings of a Symposium and Workshop held at the National Bureau of Standards
[COM-75-50071/0] N75-24183
Comprehensive technical report on all atmospheric contaminants associated with photochemical air pollution
[PB-239510/1] N75-24197
Ionization in the track of a high-energy electron in hydrocarbon liquids. Study of positive and negative ion scavenging using nanosecond pulse radiolysis
[IRI-133-74-06] N75-24455
HYDRODYNAMIC EQUATIONS
Constraints on the conical expansions in hydrodynamical models
[ORO-3992-198] N75-23894
HYDROFLUORIC ACID
Corrosion of austenitic stainless steel alloys due to HNO3-HF mixtures
[ICP-1036] N75-23765
Probes for density measurements of F2, HF, and DF in continuously operating chemical lasers
[SAND-74-0432] N75-23970
HF/DF chemical laser performance modification by chemical additives --- supersonic flow
[AD-A007263] N75-23976
HYDROFOIL CRAFT
Experimental study of model size effects on cavitation and ventilation of surface piercing struts --- hydrofoil craft
[AD-A006672] N75-23896
HYDROGEN
A study of reacting free and ducted hydrogen/air jets
[NASA-TM-X-72678] N75-23571
Investigation of hydrogen chemisorption on the tungsten [100] surface --- Auger spectroscopy
[AD-A007434] N75-23731
Reaction rates and energy distributions among reaction products for the H plus Cl2 and Cl plus H2 reactions
[AD-A007782] N75-23735
Hydrogen production from coal
[NASA-CR-142816] N75-24113
Behavior of atomic H in solid H2 from 0.2 to 0.8 K
[NASA-TM-X-71732] N75-24440
Nuclear magnetic resonance studies of solid hydrogen under high pressure
N75-24498
Observations of neutral hydrogen in the region 355 deg greater than l sup II greater than 10 deg and -5 deg greater than b sup II greater than 5 deg --- galactic radio astronomy
N75-24589
HYDROGEN CLOUDS
H2 regions and the galactic centre
[ESRO-SP-105] N75-24555
Optical observations of a few small H2 regions detected at infrared wavelengths --- density and brightness distribution
N75-24557
Optical, infrared and radio observations of two H2 regions
N75-24559
Compact infrared sources associated with southern H2 regions
N75-24560
Recent observations of the 8-13 micron spectra of H2 regions
N75-24562
Wide beam measurements of H2 regions in the infrared
N75-24564
Far infrared photometry of H2 regions --- balloon-borne telescopy
N75-24565
High-resolution maps of H2 regions at far-infrared wavelengths --- balloon-borne cassegrain telescope
N75-24567
One millimeter observations of H2 regions --- to establish mean spectral index in submillimeter region
N75-24568
New observations of H2 regions at 7.875, 15.5, 31.4, or 85 GHz
N75-24569
A high-resolution study of the H2 region W 3(OH) -- at 6, 21, and 50 cm wavelengths
N75-24571
OH and the earliest evolution of H2 regions
N75-24573
Nuclei and H2 regions in spiral galaxies: Preliminary results for M 101
N75-24575
Dust in H2 regions --- theoretical models of dusty nebulae
N75-24577
Expected far infrared polarization of H2 regions and the nuclei of galaxies
N75-24579
Carbon monoxide mapping of 100 micrometer sources associated with dark clouds: Preliminary results
N75-24582
HYDROGEN ISOTOPES
Shock waves in hydrogen isotopes and their high pressure equation of state
[UCRL-75727] N75-24513
HYDROGEN PLASMA
The balance of rotating plasma slabs
[TRITA-EPP-74-19] N75-24482
HYDROGEN SULFIDE
Corrosion fatigue of type 304 stainless steel in H2SO4 + NaCl at 25 C
N75-23748
HYDROLOGY
Correlation of hydrologic model parameters with changing land use as determined from aerial photographs
[PB-239407/0] N75-24093
HYDROMETEOROLOGY
The use of ERTS imagery in reservoir management and operation --- New England
[E75-10286] N75-24059
HYDROPLANING
Hydroplaning and tread pattern hydrodynamics
[PB-239504/4] N75-24554
HYDROSTATIC PRESSURE
Interstitial relaxations due to hydrostatic stress in niobium-oxygen alloys
N75-23743
Electrical transport properties in n GaSb under hydrostatic pressure
N75-24496
HYDROSTATICS
Hydrostatic fluid bearing gyro --- temperature control
[NASA-CR-120753] N75-23931
HYDROXYL EMISSION
OH and the earliest evolution of H2 regions
N75-24573
HYGROMETERS
Long-distance recording of the humidity over the sea
N75-24278
HYPERSONIC FLOW
Problems relating to wind tunnel simulation of relaxing flows
[AD-A007406] N75-23900
Experimental study of heat transfer in a critical point of sphere in hypersonic low-density flow
[AD-A007407] N75-23901
HYPERSONIC NOZZLES
Experimental study of the axisymmetric shaped hypersonic nozzles
[AD-A007471] N75-23517
Effect of nonequilibrium processes on the gasdynamic parameters in hypersonic installations and in the critical point of a blunted body
[AD-A007414] N75-23904
HYPERSONIC VEHICLES
Optimum control of flight vehicle under the conditions of uncertainty
[AD-A007400] N75-23640

HYPERSONIC WIND TUNNELS
Development of holographic interferometric applications in the VKF supersonic and hypersonic wind tunnels
[AD-A007689] N75-23615
Experimental study of heat transfer in a critical point of sphere in hypersonic low-density flow
[AD-A007407] N75-23901
HYPERVELOCITY PROJECTILES
Efficiency of steel fragments on thin duralumin targets
[ISL-12/74] N75-24009

I

ICE
The role of ice particulates in the electrification of the air in the mesosphere --- using OGO 6 data
N75-24202
ICE FORMATION
Microconvection in evaporation and microconvection in ice formation
N75-24268
IDEAL FLUIDS
Constraints on the conical expansions in hydrodynamical models
[ORO-3992-198] N75-23894
IGNEOUS ROCKS
Mid-infrared spectral behavior of igneous rocks
[AD-A007680] N75-24083
IGNITION SYSTEMS
Improved suppression of radiation from automobiles used by the general public
[PB-239471/6] N75-24553
IGNITION TEMPERATURE
An asymptotic ignition theory of porous solid fuels (thermo-diffusive theory) --- differential equations for the ignition of coal
N75-23798
Ignition of military fuels by hot particles
[AD-A007728] N75-23803
IMAGE CONVERTERS
The 12 GHZ image and sum enhanced mixer diode converter
[NASA-CR-143792] N75-23848
IMAGE ENHANCEMENT
The automatic acquisition of interesting objects in a cluttered image environment --- pattern recognition and image enhancement in photographic processing
N75-23815
The 12 GHZ image and sum enhanced mixer diode converter
[NASA-CR-143792] N75-23848
IMAGE TUBES
Image-storage tube for space applications. Development of the SEC target --- methods to assess target resolution, target stabilization
[ESRO-CR-212] N75-23938
IMAGES
The effects of abberrations in synthetic aperture systems
N75-24463
IMAGING TECHNIQUES
Range-Doppler imaging of rotating objects
N75-23542
The effects of aberrations in synthetic aperture systems --- using optical transfer function, imaging techniques, and photographic equipment
[AD-A007774] N75-23954
Shape and dimensional control of tridimentional objects --- Moire effects and imaging techniques
N75-24464
Image descriptors for displays
[AD-A007585] N75-24536
IMMUNITY
The influence of ionizing radiation on the immune response
[MBL-1974-28] N75-24329
Respiratory and intraperitoneal infection of mice with encephalomyocarditis virus: Effect of sublethal X-irradiation on host resistance and survival
[MBL-1975-2] N75-24331
IMPACT LOADS
Fracture behaviour and residual strength of carbon fibre composites subjected to impact loads
N75-23706
IMPLANTATION
Possible improvements to HF devices derived from irradiative control of the diffusion processes
[DTCE/3096] N75-24499
IMPLOSIONS
Carbon dioxide laser development and asymmetry in laser driven implosions
[LA-UR-74-1883] N75-23972
IMPURITIES
Effects of high doping levels silicon solar cell performance
[NASA-TM-X-71728] N75-24117
INCOMPRESSIBLE FLOW
A finite-element method for lifting surfaces in steady incompressible subsonic flow
[NASA-CR-142811] N75-23477
Steady incompressible potential flow around lifting bodies immersed in a fluid
[NASA-CR-142817] N75-23886
INDENTATION
Strength degradation of brittle surfaces: Blunt indenters --- for ceramic materials
[AD-A007447] N75-23793
INDEPENDENT VARIABLES
A method for the estimation of the parameters of a gamma distribution --- stochastic model for tectonic features
[PB-238844/5] N75-24077
INDEXES (DOCUMENTATION)
Auroral electroject magnetic activity indices AE[10] for 1966
[COM-74-50276/37] N75-24221
Evaluation and optimization of file organizations through analytic modeling
N75-24529
INDIAN OCEAN
Summary of synoptic meteorological observations. Indonesian coastal marine areas, volume 1. Area 1: Southeast Sumatra. Area 2: Christmas Island. Area 3: Sunda Strait. Area 4: Northeast Java Sea. Area 5: Bangka Island northeast. Area 6: Natuna Island. Area 7: Sarawak
[AD-A006923] N75-24242
INDUCTANCE
Development of a nonpenetrating inductance probe for measuring lubricating film thickness in a dynamic seal --- using computer programs
N75-23912
INDUSTRIAL MANAGEMENT
Vulnerability of natural gas systems --- industrial management and operations
[AD-A007583] N75-24143
INDUSTRIAL PLANTS
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 4: Data set for background investigation of atmospheric constituents for Nansemond River site --- a proposed oil refinery site
[NASA-CR-142821] N75-24122
Study of the application of HTGR to a petroleum refinery petrochemical complex
[CONF-741144-1] N75-24126
The impact of energy shortages on the iron and steel industries
[PB-238749/6] N75-24158
INDUSTRIES
Industrial energy study of the drug manufacturing industries for the Federal Energy Administration/US Department of Commerce
[PB-238994/8] N75-24130
INERTIAL NAVIGATION
Space shuttle entry and landing navigation analysis
[NASA-CR-141765] N75-23654
Electronic docking systems
[COM-75-10139/4] N75-23869
INFINITE SPAN WINGS
Studies and research on marine hulls working with natural ground effect
N75-23475
INFORMATION DISSEMINATION
Catalog of selected NMAB reports
[AD-A007358] N75-24534
INFORMATION RETRIEVAL
Scientific and technical information needs and resources in the Republic of China [Taiwan]
[PB-239492/2] N75-24550
INFORMATION SYSTEMS
Space and nuclear research and technology
[NASA-NEWS-RELEASE-75-95] N75-23619
A man-machine procedure for extracting information from data collected by the Earth Resources Technology Satellite
[PB-238431/1] N75-24073
Search service on Government Reports Announcements [GRA] magnetic tapes at the Swedish National Defence Research Institute [FOA]
[PB-238957/5] N75-24411
Applied systems ecology: Models, data, and statistical methods
[BNWL-SA-5216] N75-24425
Study of a group of documentation systems in order to determine the interconnection and the exchange possibilities at the level of sectorial networks and to recommend the means necessary for this harmonization
N75-24530
A discrete simulation model of the revised AFMPC IOC microform system
[AD-A007776] N75-24537
National energy flow accounts
[PB-239275/1] N75-24539
Scientific and technical information needs and resources in the Republic of China [Taiwan]
[PB-239492/2] N75-24550
Information devices and systems in prospecting geophysics
[AD-A007408] N75-24653
INFRARED ASTRONOMY
H2 regions and the galactic centre
[ESRO-SP-105] N75-24555
Wide beam measurements of H2 regions in the infrared
N75-24564
Infrared radiation model for the galactic centre --- interstellar dust heated by stellar radiation
N75-24587
Expected infrared molecular lines from the galactic centre
N75-24591
INFRARED DETECTORS
Pyroelectric film/liquid crystal detector for 10.6 micrometers region --- using vinylidene
[AD-A007852] N75-23949
Infrared gas filter correlation instrument for in-situ measurement of gaseous pollutants
[PB-239467/4] N75-23956
INFRARED IMAGERY
Real time display parameters study 2
[AD-A007790] N75-24367
INFRARED LASERS
Laser window surface finishing and coating technology
[AD-A007791] N75-24466
Determination of the stress-optic coefficients of Zn Se
[AD-A007778] N75-24467
Casting of halide and flouride alloys for laser windows
[AD-A007656] N75-24468
Development of optical coatings for high-intensity laser applications
[AD-A007692] N75-24470
INFRARED PHOTOGRAPHY
Optical, infrared and radio observations of two H2 regions
N75-24559
INFRARED RADIATION
Nonequilibrium radiation model for exhaust plumes
[AD-A007795] N75-23687
Compact infrared sources associated with southern H2 regions
N75-24560
The dominant 10 to 20 micrometer source in the galactic centre
N75-24585
INFRARED RADIOMETERS
Satellite infrared soundings from NOAA spacecraft --- to measure temperature and humidity
[COM-75-10256/6] N75-24260
Infrared radiometry on board Mars-5 --- Mars brightness temperature measurements
[NASA-TT-F-16344] N75-24621
INFRARED SPECTRA
Mid-infrared spectral behavior of igneous rocks
[AD-A007680] N75-24083
Red and near-infrared spectral reflectance of snow
[AD-A007732] N75-24085
Recent observations of the 8-13 micron spectra of H2 regions
N75-24562
Calculation of infrared spectra from dust in planetary nebulae
N75-24580
Dust in the galactic center --- 9.7 micron band analysis
N75-24584
INFRARED SPECTROPHOTOMETERS
Infrared observation of NGC 6334
N75-24561
INFRARED SPECTROSCOPY
Molecular mechanics of polymers by dynamic infrared techniques
N75-23786
ITS-K infrared cryogenic telescope-spectro-meter aboard Salyut-4
[NASA-TT-F-16355] N75-23936
A method for the separation of oil from an aqueous oil, detergent solution prior to IR analysis, part 2
[AD-A006826] N75-24188
Infrared spectroscopy of Comet Kohoutek --- and reflection studies of frost spectra
[NASA-CR-142809] N75-24597
INFRARED STARS
NGC 7635 and its stellar nucleus --- emphasizing infrared data
N75-24558
INHIBITORS
Reactivating potency of some oximes towards phosphylated acetylcholinesterase
[TDCK-65518] N75-24310
INITIATION
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 2: Studies on the specificity of initiation of transcription
[MBL-1975-5] N75-24312
INLET FLOW
Analysis of fluid flow in the entrance region of a duct with an eccentric annular cross-section
N75-23472
INOCULATION
Respiratory and intraperitoneal infection of mice with encephalomyocarditis virus: Effect of sublethal X-irradiation on host resistance and survival
[MBL-1975-2] N75-24331

INPUT/OUTPUT ROUTINES
COBOL compiler validation system [1974] [X3.23-1974] ANS COBOL 1974. Sequential I-O module test specifications
[AD-A002973] N75-24395
INSTRUMENT ERRORS
FAA lightning protection study: Lightning protection requirements for AIL type 55 K instrument landing system
[AD-A008931] N75-23530
INSTRUMENT LANDING SYSTEMS
FAA lightning protection study: Lightning protection requirements for AIL type 55 K instrument landing system
[AD-A008931] N75-23530
FAA lightning protection study: Lightning protection requirements for Wilcox mark 1/A instrument landing system
[AD-A008934] N75-23545
Design recommendation for a lightning elimination system for FAA category 3 instrument landing system, NAFEC, Atlantic City, New Jersey
[AD-A008933] N75-23609
INTAKE SYSTEMS
The measurement of the transonic spillage drag of a supersonic intake
N75-23488
Temperature measurement for advanced gas turbine controls
N75-23597
INTEGRAL EQUATIONS
A generalized inversion program --- integral equations and iterative solution
[COM-75-50159/3] N75-24406
INTEGRATED CIRCUITS
Preliminary studies for high tension integrated circuits --- including electrical insulation and resistivity
[MDB/MD-3055] N75-23847
Complementary MOS transistors in micropower circuits
[AD-A007272] N75-23859
Total-dose radiation-hardened COS/MOS integrated circuits
[AD-A007618] N75-23861
Fault detection through parallel processing in Boolean algebra
[AD-A007552] N75-24397
Integrated optical circuit devices
[AD-A007512] N75-24471
INTERATOMIC FORCES
Effect of a long range interatomic potential on the stability of crystal lattices
[LBL-3151] N75-23767
INTERFERENCE DRAG
Subsonic base and boattail drag, an analytical approach
N75-23492
The subsonic base drag of cylindrical twin-jet and single-jet afterbodies
N75-23498
INTERFEROMETERS
Development of holographic interferometric applications in the VKF supersonic and hypersonic wind tunnels
[AD-A007689] N75-23615
INTERNATIONAL RELATIONS
The Intergovernmental Oceanographic Commission: An uncertain future
[COM-75-10233/5] N75-24287
INTERNATIONAL TRADE
The economics of energy and natural resource pricing
[GPO-48-071] N75-24115
INTERPLANETARY MAGNETIC FIELDS
A study of geomagnetic storms
[NASA-CR-142800] N75-24208
INTERPLANETARY MEDIUM
Interplanetary charged particle models [1974] --- and the effects of cosmic exposure upon spacecraft and spacecraft components
[NASA-SP-8118] N75-24607
INTERPLANETARY SPACE
A new look at Jupiter: Results at the now frontier --- Pioneer 10, interplanetary space, and Jupiter atmosphere
[NASA-TM-X-66832] N75-24636
INTERPLANETARY SPACECRAFT
Pressures and elevations from CO2 band intensities based on measurements made on board the Mars-5 automatic interplanetary station [preliminary results]
[NASA-TT-F-16346] N75-23671
Spectrophotometry of Mars in the 2-5 micrometer range on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16345] N75-24620
INTERSTELLAR GAS
The gas-to-dust ratio in the Orion nebula
N75-24581
INTERSTELLAR MATTER
Evolutionary characteristics of a bimodal grain model --- interstellar grains
N75-24576
Infrared radiation model for the galactic centre --- interstellar dust heated by stellar radiation
N75-24587
INTERSTITIALS
Interstitial relaxations due to hydrostatic stress in niobium-oxygen alloys
N75-23743
INTERVALS
Application of internal analysis to problems of linear control systems --- boundary value problems and set theory
N75-24413
INVARIANCE
Invariant dynamics of flight vehicles under rotating reference frames
[AD-A007671] N75-23642
INVISCID FLOW
Theory of mixing flow of a perfect fluid around an afterbody and a propulsive jet
N75-23493
Prediction of the optimum location of a nacelle shaped body on the wing of a wing-body configuration by inviscid flow analysis
N75-23510
ION DENSITY [CONCENTRATION]
A semi-automated system for the true-height analysis of film ionograms. Part 2: Converting from hand to machine methods --- ionospheric electron and ion density
[COM-75-10217/8] N75-24222
ION ENGINES
Power processor for a 30cm ion thruster
[NASA-CR-134785] N75-23679
ION EXCHANGE MEMBRANE ELECTROLYTES
X-ray analysis of metal traces in petroleums using ion exchange membranes
[NASA-TT-F-16288] N75-23724
Research for preparation of cation-conducting solids by high-pressure synthesis and other methods
[NASA-CR-134836] N75-24504
ION IMPLANTATION
Characterization of implanted silicon by Raman and infrared spectrocopy
N75-24013
Ion implantation of diatomic sulfur into GaAs
[AD-A006801] N75-24514
Ion implantation sources and source materials
[AD-A007431] N75-24516
ION PRODUCTION RATES
The flux of particle loss in a permeable plasma
[TRITA-EPP-74-20] N75-24483
ION SELECTIVE ELECTRODES
Determination of fluoride in fluomica and fluomica-alumina composites with the fluoride electrode
[AD-A007764] N75-23736
IONIZATION
The role of ice particulates in the electrification of the air in the mesosphere --- using OGO 6 data
N75-24202
IONOGRAMS
Ray-tracing simulation of swept-frequency backscatter ionograms
[AD-A007686] N75-23832
A semi-automated system for the true-height analysis of film ionograms. Part 2: Converting from hand to machine methods --- ionospheric electron and ion density
[COM-75-10217/8] N75-24222
IONOSPHERIC ELECTRON DENSITY
The effects of field aligned ionization models on the electron densities and total flux tubes contents deduced by the method of whistler analysis
[AERONOMICA-ACTA-A-139-1974]
N75-24205
A semi-automated system for the true-height analysis of film ionograms. Part 2: Converting from hand to machine methods --- ionospheric electron and ion density
[COM-75-10217/8] N75-24222
Preliminary results of two-frequency radio-occultation of the Mars ionosphere by means of Mars planetary probes in 1974
[NASA-TT-F-16340] N75-24625
IONOSPHERICS
Report of NRL progress --- including metal fatigue, radio communication, and ionospherics
[PB-238839/5] N75-24664
IRON
The impact of energy shortages on the iron and steel industries
[PB-238749/6] N75-24158
IRON ALLOYS
Modified ferritic iron alloys with improved high-temperature mechanical properties and oxidation resistance
[NASA-TN-D-7966] N75-23760
Role of deformation induced phase transformations in the plasticity of some iron-base alloys
[LBL-2775] N75-23768
The effect of grain size and retained austenite on the ductile-brittle transition of a titanium-gettered iron alloy
[AD-A007360] N75-23780
IRRIGATION
Irrigation scheduling, freeze warning and soil salinity detecting --- in Cameron County Texas
[E75-10285] N75-24058
ISENTROPIC PROCESSES
Relationships between motion on isentropic surfaces from 3-H rawinsonde data and radar echoes
[NASA-CR-2558] N75-24232
ITERATIVE SOLUTION
A generalized inversion program --- integral equations and iterative solution
[COM-75-50159/3] N75-24406
Plasma equilibrium in external ring systems
[TRITA-EPP-74-23] N75-24486

J

JET AIRCRAFT NOISE
Sound and vibration measurements for Concorde supersonic transport and subsonic jet aircraft
[PB-238748/8] N75-24436
JET CONTROL
An air intake control system for a supersonic fighter aircraft
N75-23589
JET ENGINE FUELS
High temperature tests of a JP-5 type fuel
[AD-A007662] N75-23603
Development of high stability fuel
[AD-A007574] N75-23604
Droplet diameter and size distribution of JP-4 fuel injected into a subsonic airstream
[AD-A007687] N75-24192
JET ENGINES
Full scale upper surface blown flap noise
[NASA-TM-X-71708] N75-23569
JET EXHAUST
Jet interference of a podded engine installation at cruise conditions
N75-23490
JET FLOW
Theory of mixing flow of a perfect fluid around an afterbody and a propulsive jet
N75-23493
An experimental investigation of the turbulent characteristics of co-axial jet flows and their role in aerodynamic noise generation
N75-24161
JET LIFT
Detailed experimental and theoretical analysis of the aerodynamic interference between lifting jets and the fuselage and wing
N75-23509
JET MIXING FLOW
Multiple jet study data correlations --- data correlation for jet mixing flow of air jets
[NASA-CR-134795] N75-23572
JET PROPULSION
Twin jet exhaust system test techniques --- integrating airframe and propulsion system for wind tunnel models
N75-23500
Airframe: Engine interaction for engine configurations mounted above the wing. Part 2: Engine jet simulation problems in wind tunnel tests
N75-23512
JET THRUST
Thrust/drag analysis for a front fan nacelle having two separate co-axial exhaust streams
[ARC-CP-1311] N75-23574
JOINTS [JUNCTIONS]
Durability of adhesive bonded joints --- and surface preparation methods
[AD-A007873] N75-24010
JUPITER [PLANET]
Plasma in the Jovian magnetosphere
[NASA-CR-142761] N75-24605
Jupiter: Giant of the solar system --- its solar orbits
[NASA-TM-X-66827] N75-24631
Jupiter: As a planet --- its physical characteristics and radio waves emitted from Jupiter
[NASA-TM-X-66828] N75-24632
Jupiter and planet Earth --- planetary and biological evolution and natural satellites
[NASA-TM-X-66829] N75-24633
Mission to Jupiter --- Pioneer 10 and 11 space probes
[NASA-TM-X-66830] N75-24634
Encounter with Jupiter --- Pioneer 10 space probe
[NASA-TM-X-66831] N75-24635
A new look at Jupiter: Results at the now frontier --- Pioneer 10, interplanetary space, and Jupiter atmosphere
[NASA-TM-X-66832] N75-24636
Pioneer 11 encounter --- with Jupiter
[NASA-TM-X-66833] N75-24637
JUPITER ATMOSPHERE
Preliminary model studies of the magnetosphere of Jupiter: Pioneer 10
[NASA-CR-142813] N75-24626
Jupiter: As a planet --- its physical characteristics and radio waves emitted from Jupiter
[NASA-TM-X-66828] N75-24632
A new look at Jupiter: Results at the now frontier --- Pioneer 10, interplanetary space, and Jupiter atmosphere
[NASA-TM-X-66832] N75-24636

Velocity variations of an Equatorial plume throughout a Jovian year
[NASA-CR-142894] N75-24639
A review of the Jovian magnetosphere based upon Pioneer 10 and 11
[NASA-TM-X-70900] N75-24643

K

KALMAN FILTERS
A Kalman filter for the Stoland system
[NASA-CR-137668] N75-23543
A maximum entropy filter --- a discussion of fast Fourier transformations and signal processing
[AD-A007482] N75-23834
Estimation with quantized measurements --- using Kalman filters and linear transformations
N75-24379

KAPITZA RESISTANCE
Kapitza resistance and the reflection coefficient of heat pulses
N75-24462

KELVIN-HELMHOLTZ INSTABILITY
Problems in nonlinear mechanics of unstable waves in turbulent and in stratified shear flows. Part 1: Development of the noise-producing large-scale structure in a turbulent jet. Part 2: Nonlinear KelvinHelmholtz waves and the vertical mixing mechanism in a stratified shear flow. Part 3: Nonlinear interactions of the large-scale coherent structure and turbulence in a free shear flow
N75-23874

KENTUCKY
Hydraulic and flow studies related to sediment transport, Kentucky River, Kentucky
[PB-239259/5] N75-24092

KINETICS
Questions of the kinetics of stimulated gamma radiation --- resonant frequencies and the Mossbauer effect
N75-23967

KIRCHHOFF LAW
On the generalization of Kirchhoff formula
[NASA-TT-F-16332] N75-24430

L

LAGEOS [SATELLITE]
Laser geodynamic satellite thermal/optical/vibrational analyses and testing. Volume 1: Executive summary --- retroreflector performance
[NASA-CR-120754] N75-23933
Laser geodynamic satellite thermal/optical/vibrational analyses and testing, volume 2, book 1 technical report --- retroreflector performance
[NASA-CR-120755] N75-23934
Laser geodynamic satellite thermal/optical/vibrational analysis and testing, volume 2, book 2 --- cubes and far fields
[NASA-CR-120756] N75-23935

LAKE SUPERIOR
Spring and fall thermal bar development in Lake Superior
[PB-239227/2] N75-24184

LAMINAR BOUNDARY LAYER
Unsteady momentum integral analysis of the laminar boundary layer on an elliptic cylinder oscillating in pitch
N75-23878
Supersonic laminar boundary layer flow past a wavy wall with multiple separation regions
[AD-A007433] N75-23905

LAMINAR FLOW
Laminar flow heat transfer in ordinary and augmented tubes
N75-23879

LAMINATES
Failure criteria to fracture mode analysis of composite laminates
N75-23700
Practical finite element method of failure prediction for composite material structures
N75-23703
Characteristics of crack propagation at the interface between two dissimilar media, phase 1
[AD-A007293] N75-23714
Study on the behavior of layered glass-resin under dynamic load [fatigue]
N75-24030
The criterion for optimum character for the selection of the thicknesses of plates which are located under the action of bending load
[AD-A007455] N75-24046
Non-linear wave propagation in heterogeneous anisotropic plates
N75-24428

LAND MANAGEMENT
Evaluation of the application of ERTS-1 data to the regional land use planning process --- Northeast Wisconsin
[E75-10280] N75-24053
Proceedings from the Gulf States Conference on Coastal Zone Management
[COM-75-10201/2] N75-24081

LAND USE
Evaluation of the application of ERTS-1 data to the regional land use planning process --- Northeast Wisconsin
[E75-10280] N75-24053
Study of USGS/NASA land use classification system --- computer analysis from LANDSAT data
[NASA-CR-120763] N75-24069
Determining land use changes in watersheds by aerial photographic measurements
[PB-239192/8] N75-24080
Correlation of hydrologic model parameters with changing land use as determined from aerial photographs
[PB-239407/0] N75-24093
Guidelines for air quality maintenance planning and analysis. Volume 4: Land use and transportation considerations
[PB-237583/0] N75-24171

LANDING AIDS
Space shuttle entry and landing navigation analysis
[NASA-CR-141765] N75-23654

LANDING GEAR
The effect of chine tires on nose gear water-spray characteristics of a twin engine airplane
[NASA-TM-X-72695] N75-23555

LANDING MODULES
Operation of descent module of the Mars-6 automatic interplanetary station in the Martian atmosphere
[NASA-TT-F-16334] N75-23631
Experimental measuring composition of Martian atmosphere on board the descent module of the Mars-6 space station
[NASA-TT-F-16335] N75-24616

LANDSAT C
ERTS-C [Landsat 3] cryogenic heat pipe experiment definition
[NASA-CR-143797] N75-23882

LANDSAT SATELLITES
Study of USGS/NASA land use classification system --- computer analysis from LANDSAT data
[NASA-CR-120763] N75-24069

LANDSAT 1
Second EROS/AID international course on remote sensing
[PB-239479/9] N75-24088
Analysis of ERTS-A satellite photos for NOAA-AOML study to detect ocean eddies [sic]
[COM-75-10192/3] N75-24282

LANDSAT 2
LANDSAT-2 launch and flight activation. Launch through orbit 50 and orbit adjust operation --- telemetry data processing
[NASA-CR-143744] N75-23630

LANGUAGES
Construction of a monolingual thesaurus on atmospheric pollution --- French language
N75-24531

LASER ALTIMETERS
Pressures and elevations from CO2 band intensities based on measurements made on board the Mars-5 automatic interplanetary station [preliminary results]
[NASA-TT-F-16346] N75-23671

LASER APPLICATIONS
Electron laser-pulse scattering
N75-23961
Time development of ultrashort pulse generation from a Nd:glass laser with a saturable dye and short laser pulse damage of GaAs and ZnTe at 1.06 microns
N75-23964
Deformation of the atmosphere by intense laser beams at 10.6 microns --- atmospheric effects
[DREV-TN-2099/74] N75-23965
On the question of induced Mossbauer gamma radiation --- laser applications
N75-23966
Modelocked, multiline pulsed CO2 oscillator
[LA-5839-MS] N75-23971
Carbon dioxide laser development and asymmetry in laser driven implosions
[LA-UR-74-1883] N75-23972
A computer code for time dependent recombination lasers --- to solve population inversion problems
[AD-A007292] N75-23975
A tunable dye laser diagnostic facility --- optical pumping and molecular energy levels
[AD-A007620] N75-23979
Experimental pulsed laser, remote crosswind measurement system, feasibilty study and design, part 2
[AD-A007350] N75-23981
Spheroidization of normal and deuterated polyethylene --- laser applications
[SAND-74-0318] N75-23996
Development of chalcopyrite crystals for nonlinear optical applications
[AD-A007838] N75-24469
Development of optical coatings for high-intensity laser applications
[AD-A007692] N75-24470

LASER MODE LOCKING
Selected contributions to high-speed physics --- covering mechanical-electrical energy conversion in ferroelectric ceramics, and mode locked pulsed lasers
[BMVG-FBWT-74-8] N75-23804
Application of mode locked solid state lasers to photographic investigation of transient phenomena
N75-23806
Modelocked, multiline pulsed CO2 oscillator
[LA-5839-MS] N75-23971

LASER OUTPUTS
Parameters of the pulsed phosphorus laser system
[AD-A007694] N75-23982

LASER PLASMAS
Measurement of several rate coefficients for the He-Ne laser plasma
N75-24472

LASERS
Calculations of laser induced spall in aluminum targets
[LA-5619-MS-REV] N75-23968
Development of chalcopyrite crystals for nonlinear optical applications
[AD-A007838] N75-24469

LATERAL CONTROL
Approximate optimum control of the angle of roll in the problem of the reentry of hypersonic vehicles
[AD-A007456] N75-23641

LAUNCH VEHICLE CONFIGURATIONS
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [iA14B], volume 1
[NASA-CR-141522] N75-23647
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [IA14B], volume 2
[NASA-CR-141523] N75-23648
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the 11-foot unitary plan wind tunnel for Mach 0.6 and 0.9 [0A22A]
[NASA-CR-141529] N75-23649
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the arc 9 by 7-foot unitary plan wind tunnel for Mach 1.55 and 2.2 [OA22B]
[NASA-CR-141530] N75-23650
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 3
[NASA-CR-134445] N75-23657
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 4
[NASA-CR-134446] N75-23658
Airloads investigation of an 0.30-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 5
[NASA-CR-134447] N75-23659
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 6
[NASA-CR-134448] N75-23660
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 7
[NASA-CR-134449] N75-23661
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the arc 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 8
[NASA-CR-134450] N75-23662
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 9
[NASA-CR-141501] N75-23663
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140 A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for MACH range 0.6 to 1.4 [IA14A], volume 10
[NASA-CR-141502] N75-23664
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 11
[NASA-CR-141503] N75-23665

LEADING EDGE SLATS
Effect of canard position and wing leading-edge flap deflection on wing buffet at transonic speeds
[NASA-TM-X-72681] N75-23559

LEADING EDGES
Subscale, hydrogen-burning, airframe-integrated-scramjet: Experimental and theoretical evaluation of a

water cooled strut airframe-integrated-scramjet: Experimental leading edge
[NASA-TM-X-72682] N75-23885
LENS DESIGN
Acoustic lens design
[AD-A007847] N75-24435
LEPTONS
Leptons production in hadronic collisions, partons, vector mesons and new particles
[PM/75/3] N75-24456
LEVEL
Recent changes in the ocean level
N75-24263
LIFE [DURABILITY]
Ionization in the track of a high-energy electron in hydrocarbon liquids. Study of positive and negative ion scavenging using nanosecond pulse radiolysis
[IRI-133-74-06] N75-24455
LIFE SUPPORT SYSTEMS
Phase 1 engineering and technical data report for the thermal control extravehicular life support system
[NASA-CR-141793] N75-24360
LIFT
Ground effects for jet lift VTOL
[NASA-TT-F-16359] N75-23480
LIFTING BODIES
A finite-element method for lifting surfaces in steady incompressible subsonic flow
[NASA-CR-142811] N75-23477
Steady incompressible potential flow around lifting bodies immersed in a fluid
[NASA-CR-142817] N75-23886
LIGHT [VISIBLE RADIATION]
Photometry in the 3200-9000 A range on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16347] N75-23923
LIGHT ADAPTATION
On rod visual acuity and cone visual acuity --- color vision and light adaptation
[NASA-TT-F-16315] N75-24323
LIGHT BEAMS
Laser beam deflection utilizing index of refraction gradients in liquid mediums
N75-23962
LIGHT CURVE
The use of supernovae light curves for testing the expansion hypothesis and other cosmological relations
N75-24592
LIGHT MODULATION
Electron photon interactions in semiconductors
N75-24465
LIGHT SCATTERING
Cavitation inception thresholds in water and nuclei spectra by light scattering technique
[PB-238448/5] N75-23895
On the statistical theory of the propagation and scattering of light in simple fluids
N75-24460
LIGHT SOURCES
On the visibility of luminance fluctuations in television pictures, and exposure variations in motion picture film
[BBC-RD-1975/13] N75-23819
LIGHTNING
FAA lightning protection study: Lightning protection requirements for AIL type 55 K instrument landing system
[AD-A008931] N75-23530
FAA lightning protection study: Lightning protection requirements for Wilcox mark 1/A instrument landing system
[AD-A008934] N75-23545
Design recommendation for a lightning elimination system for FAA category 3 instrument landing system, NAFEC, Atlantic City, New Jersey
[AD-A008933] N75-23609
LINE SPECTRA
High resolution spectra of rare earth crystals
[AD-A007262] N75-23732
Determination of electron temperature in a penning discharge by the helium line ratio method
[NASA-TM-X-71677] N75-24478
Radio recombination lines from carbon and heavier elements from the direction of NGC 2024
N75-24572
Expected infrared molecular lines from the galactic centre
N75-24591
A table of semiempirical gf values. Part 1: Wavelengths: 5.2682 nm to 272.3380 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142879] N75-24599
A table of semiempirical gf values. Part 2: Wavelengths: 272.3395 nm to 599.3892 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142880] N75-24600
A table of semiempirical gf values. Part 3: Wavelengths: 599.4004 nm to 9997.2746 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142881] N75-24601
Solar gamma-ray lines as probes of accelerated particle directionalities in flares
[NASA-TM-X-70890] N75-24646
LINEAR PROGRAMMING
Using blossoms to find maximum matchings on graphs
[PB-238971/6] N75-24377
Some experiments on the accuracy of three methods of updating the inverse in the simplex method
[AD-A007148] N75-24399
LINEAR SYSTEMS
Linearization of FM-CW radar sweep by feedback
[AD-A007867] N75-23551
Estimation with quantized measurements --- using Kalman filters and linear transformations
N75-24379
Application of internal analysis to problems of linear control systems --- boundary value problems and set theory
N75-24413
Control of mixed distributed and lumped parameter systems --- linear systems governed by set of ordinary and partial differential equations
N75-24418
LINEAR TRANSFORMATIONS
Estimation with quantized measurements --- using Kalman filters and linear transformations
N75-24379
LIQUID CRYSTALS
Controllable liquid artificial dielectric S-band phase shifters
[AD-A007785] N75-23868
Pyroelectric film/liquid crystal detector for 10.6 micrometers region --- using vinylidene
[AD-A007852] N75-23949
LIQUID HELIUM
Polarization potentials and elementary excitations in strongly interacting quantum liquids
N75-23875
LIQUID METALS
Thermodynamics of liquid metal MHD converters
[AD-A007415] N75-24141
LIQUID OXYGEN
Bibliography on contaminants and solubility of organic compounds in oxygen
[NASA-TM-X-71700] N75-23688
Critical flow and pressure ratio data for LOX flowing through nozzles
[NASA-TM-X-71725] N75-23883
LIQUID PHASES
Laser beam deflection utilizing index of refraction gradients in liquid mediums
N75-23962
LIQUID SLOSHING
Natural oscillations of liquid in a horizontal container with symmetric double-connected cross section
[AD-A007312] N75-23906
LIQUID SODIUM
High temperature ultrasonic transducers for in-sodium service
[HEDL-SA-726] N75-23937
Computer controlled data acquisition system for the high temperature sodium test facility
[HEDL-TME-74-60] N75-24533
LIQUIDS
Generalized characteristics of electrical conductance film thickness gauges
[PB-238949/2] N75-23958
Liquid film thickness measurement: Design and use of a conductance probe
[PB-238950/0] N75-23959
LITERATURE
In outer space
[NASA-TT-F-16252] N75-23625
Collected reprints: 1971-1972: Atmospheric physics and chemistry laboratory --- considering weather modification
[COM-75-10260/8] N75-24258
LITHIUM
Feasibility studies on the radiochemical lithium solar neutrino experiment
[BNL-19300] N75-24442
LIZARDS
Several question of the phylogeny and system of lacertilia [seu sauria]
[NASA-TT-F-16354] N75-24295
LOAD DISTRIBUTION [FORCES]
Residual stresses in notches produced by variable operational loads and their importance for the application of the linear cumulative damage hypothesis
[RAE-LIB-TRANS-1800] N75-24033
CGR: An improved computerized model to predict fatigue crack growth under spectrum loading
[AD-A007481] N75-24043
LOADING RATE
Load and frequency control for interconnected power systems
[PB-239278/5] N75-23857
LOADS [FORCES]
Calculation of the reinforced thin-walled construction by the method of the final element
[AD-A007307] N75-23560
An experimental study to determine failure envelope of composite materials with tubular specimens under combined loads and comparison between several classical criteria
N75-23701
The criterion for optimum character for the selection of the thicknesses of plates which are located under the action of bending load
[AD-A007455] N75-24046
LOGIC CIRCUITS
Lower bounds on merging networks
[PB-238554/0] N75-23855
An asynchronous logic array
[PB-238681/1] N75-24374
NOR network transduction procedures: Merging of gates and substitution of gates for fan-in and fan-out restricted networks [NETTRA-G3-FIFO and NETTRA-FG1-FIFO]
[PB-238944/3] N75-24401
LOGIC DESIGN
An asynchronous logic array
[PB-238681/1] N75-24374
LOGISTICS MANAGEMENT
Air Force Flight Test Center technology needs. Annual report for calendar year 1974
[AD-A007840] N75-23616
LONG RANGE WEATHER FORECASTING
Automated long range [ANALOG] forecast model
[AD-A007846] N75-24252
LONGITUDINAL CONTROL
Calculation of static longitudinal aerodynamic characteristics of STOL aircraft with upper surface blown flaps
[NASA-CR-137646] N75-23483
LONGITUDINAL STABILITY
Calculation of static longitudinal aerodynamic characteristics of STOL aircraft with upper surface blown flaps
[NASA-CR-137646] N75-23483
Aerodynamic characteristics of an axisymmetric body undergoing a uniform pitching motion
[AD-A007553] N75-23523
Wing longitudinal stability criteria
[AD-A007430] N75-23527
The influence of short springs on longitudinal static stability
[CRANFIELD-AERO-29] N75-23607
LOW ASPECT RATIO
Account of shearing strain during the calculation of the oscillations of low aspect-ratio wing by the method of polynomials
[AD-A007397] N75-23518
LOW CURRENTS
Complementary MOS transistors in micropower circuits
[AD-A007272] N75-23859
LOW DENSITY FLOW
Experimental study of heat transfer in a critical point of sphere in hypersonic low-density flow
[AD-A007407] N75-23901
LOW GRAVITY MANUFACTURING
Undercooling of materials during solidification in space
[NASA-CR-120750] N75-23624
Studies on immiscible alloys --- the processing of gallium-bismuth in a low-gravity environment
[NASA-CR-120764] N75-23759
LOW PASS FILTERS
A digital algorithm for spectral deconvolution with noise filtering and peak picking: NOFIPP-DECON
[NASA-TM-X-64927] N75-24383
LOW TEMPERATURE
Low temperature magnetization for Heisenberg ferromagnet
[JINR-P4-8032] N75-24432
Behavior of atomic H in solid H2 from 0.2 to 0.8 K
[NASA-TM-X-71732] N75-24440
LOW TEMPERATURE TESTS
Study of very pure metals at low temperature
[ORO-3665-44] N75-23764
Low temperature calorimetry of transition metal alloys --- alloys of ferromagnetic metals with titanium
N75-24492
LOW THRUST PROPULSION
On the electric propulsion/mission system: Energy, constraints, and characteristic surfaces --- for low thrust space flight
N75-23674
LUBRICANTS
Development of a nonpenetrating inductance probe for measuring lubricating film thickness in a dynamic seal --- using computer programs
N75-23912
LUBRICATING OILS
The state of the art in oil quality gaging on US military and commercial aircraft
[AD-A007682] N75-23565
Lubricating oil burn-off in Coast Guard power plants
[AD-A007313] N75-23811
The action of oil additives --- extreme pressure
N75-23994
Development of new space lubricants --- for despin satellite antenna drive bearings
N75-23997

LUBRICATION
Effect of longitudinal surface finish on elastohydrodynamic lubrication
[NASA-TN-D-7967] N75-23990
LUGS
Fatigue properties of aircraft lugs with interference fit
[TAE-243] N75-24031
LUMINESCENCE
Absorption and luminescence of glasses during electron irradiation
[BNL-19348] N75-23790
LUNAR EXPLORATION
New look of the old moon --- exploration of the moon since 1959
[NASA-TT-F-16253] N75-24640
LUNAR ROCKS
Compaction by impact of unconsolidated lunar fines
[NASA-CR-142877] N75-24638
LUNAR SOIL
Compaction by impact of unconsolidated lunar fines
[NASA-CR-142877] N75-24638
LYMAN ALPHA RADIATION
Measurement of intensity and spectral characteristics of radiation in the Lyman-alpha line in the upper Martian atmosphere
[NASA-TT-F-16339] N75-24612

M

MACH NUMBER
Application of local linearization and the transonic equivalence rule to the flow about slender analytic bodies at Mach numbers near 1.0
[NASA-TM-X-72654] N75-23890
MACHINE-INDEPENDENT PROGRAMS
Study of the modifications needed for efficient operation of NASTRAN on the Control Data Corporation STAR-100 computer
[NASA-CR-132644] N75-24382
MACHINING
Direct digital numerical controller for machine tools
[Y-1966] N75-24373
MAGNESIUM COMPOUNDS
Densification-mechanism modeling of the pressure-sintering behavior of MgAl2O4
N75-23984
MAGNET COILS
Initial operation of Siemens superconducting prototype magnet W VII at the Plasma Physics Institute
[NASA-TT-F-16291] N75-24479
MAGNETIC ANOMALIES
Anomalous Hall effect in metals with small concentrations of localized magnetic defects
N75-23750
MAGNETIC DISTURBANCES
Auroral electroject magnetic activity indices AE[10] for 1966
[COM-74-50276/37] N75-24221
MAGNETIC FIELD CONFIGURATIONS
Plasma equilibria with closed magnetic field lines
N75-24474
On tornado traps operated as rotating plasma devices
[TRITA-EPP-74-22] N75-24485
MAGNETIC FIELDS
Investigation of the galvanomagnetic properties of graphite in magnetic fields up to 500 kOe at low temperatures --- the Hall effect and electrical resistance
[NASA-TT-F-16387] N75-23787
Catalog of particles and fields data 1958-1965
[NASA-TM-X-72574] N75-24211
Catalog of particles and fields data 1966-1973
[NASA-TM-X-72575] N75-24212
High field susceptibility in ferromagnetic NpOs2
[CONF-741057-3] N75-24510
MAGNETIC PROPERTIES
Excitations and magnetic properties of rare-earth Al2 compounds
[RISO-312] N75-23772
Magnetic properties of neodymium-samarium-cobalt alloys
[AD-A007848] N75-24520
MAGNETIC STORMS
A study of geomagnetic storms
[NASA-CR-142800] N75-24208
MAGNETIC TAPES
Search service on Government Reports Announcements [GRA] magnetic tapes at the Swedish National Defence Research Institute [FOA]
[PB-238957/5] N75-24411
MAGNETICALLY TRAPPED PARTICLES
The flux of particle loss in a permeable plasma
[TRITA-EPP-74-20] N75-24483
Plasma equilibrium in external ring systems
[TRITA-EPP-74-23] N75-24486
MAGNETIZATION
Low temperature magnetization for Heisenberg ferromagnet
[JINR-P4-8032] N75-24432
Neutron scattering and magnetization measurements on the Kondo compound CeAl3
[CONF-741202-13] N75-24450
MAGNETOHYDRODYNAMIC GENERATORS
Thermodynamics of liquid metal MHD converters
[AD-A007415] N75-24141
MAGNETOHYDRODYNAMIC STABILITY
Drift wave instabilities in plasmas with shear flow
[MPI-PAE/EXTRATERR-106] N75-24476
MAGNETOMETERS
Summary of initial results from the GSFC fluxgate magnetometer on Pioneer 11
[NASA-TM-X-70899] N75-24642
MAGNETOSPHERE
HEOS 2 plasma observations in the distant polar magnetosphere: The plasma mantle
[MPI-PAE/EXTRATERR-108] N75-24207
An analysis of imperfections in DMSP photographs caused by high energy solar and trapped protons
[AD-A007679] N75-24249
Preliminary model studies of the magnetosphere of Jupiter: Pioneer 10
[NASA-CR-142813] N75-24626
A review of the Jovian magnetosphere based upon Pioneer 10 and 11
[NASA-TM-X-70900] N75-24643
MAGNETOSPHERIC ELECTRON DENSITY
The effects of field aligned ionization models on the electron densities and total flux tubes contents deduced by the method of whistler analysis
[AERONOMICA-ACTA-A-139-1974]
N75-24205
MAGNETOSPHERIC ION DENSITY
Plasma in the Jovian magnetosphere
[NASA-CR-142761] N75-24605
MAGNETS
Manual for the use of particle trajectories programs to first order of the optic series
[ISN-74-12] N75-24447
MAN MACHINE SYSTEMS
Use of interactive computer graphics in water resources planning and management
[PB-238631/6] N75-24079
Development and validation of methods for man-made machine interface evaluation --- for shuttles and shuttle payloads
[NASA-CR-142824] N75-24359
Man-machine communications: An examination of the machines
N75-24371
MANAGEMENT INFORMATION SYSTEMS
Guidelines for air quality maintenance planning and analysis. Volume 2. Plan preparation
[PB-237581/4] N75-24169
Guidelines for air quality maintenance planning and analysis. Volume 3: Control strategies
[PB-237582/2] N75-24170
Guidelines for air quality maintenance planning and analysis. Volume 6. Overview of air quality maintenance area analysis
[PB-237584/8] N75-24172
Guidelines for air quality maintenance planning and analysis. Volume 7. Projecting county emissions
[PB-237611/9] N75-24173
Guidelines for air quality maintenance planning and analysis. Volume 8: Computer-assisted area source emission gridding procedure
[PB-237585/5] N75-24174
Guidelines for air quality maintenance planning and analysis. Volume 10: Reviewing new stationary sources
[PB-237535/0] N75-24175
Guidelines for air quality maintenence planning and analysis: Volume 11: Air quality monitoring and data analysis
[PB-237626/7] N75-24176
Guidelines for air quality maintenance planning and analysis. Volume 12: Applying atmospheric simulation models to air quality maintenance areas
[PB-237750/5] N75-24177
On-line management information system feasibility in an R and D environment
[AD-A007723] N75-24528
Setup of administrative computer service described
N75-24659
MANAGEMENT METHODS
Applications of remote sensing to watershed management
[NASA-TM-X-70896] N75-24072
MANAGEMENT PLANNING
Evaluation of the application of ERTS-1 data to the regional land use planning process --- Northeast Wisconsin
[E75-10280] N75-24053
An operational framework for coastal zone management planning
[PB-239519/2] N75-24090
Engineering of quality software systems [effects of management philosophy on software production]
[AD-A007767] N75-24388
Evaluation of policy related research in the field of municipal solid waste management
[PB-239375/9] N75-24547
MANEUVERABILITY
Electronic docking systems
[COM-75-10139/4] N75-23869
MANGANESE
Manganese in Virginia soils and correction of manganese deficiency in soybeans [Glycine max L.]
N75-24071
MANNED SPACECRAFT
Manned systems utilization anaylsis. Study 2.1: Space servicing pilot program study --- for automated payloads
[NASA-CR-142758] N75-23620
MAPPING
Study of USGS/NASA land use classification system --- computer analysis from LANDSAT data
[NASA-CR-120763] N75-24069
Infrared observation of NGC 6334
N75-24561
Carbon monoxide mapping of 100 micrometer sources associated with dark clouds: Preliminary results
N75-24582
MARAGING STEELS
An investigation of the effect of shot peening on the rotating bending fatigue endurance of chromium plated 18% Ni maraging steel
[AQD/U-000667] N75-23773
MARINE ENVIRONMENTS
UHF multipath phenomena in a marine environment
[COM-75-10266/5] N75-23841
Proceedings of seminar on methodology for monitoring the marine environment
[PB-239052/4] N75-24178
MIT sea grant: Using the seas to serve people
[COM-75-10269/9] N75-24292
MARINE METEOROLOGY
Bermuda environmental scenario
[AD-A007448] N75-24253
Collected reprints: 1973. Atlantic oceanographic and meteorological laboratories
[COM-75-50164/3] N75-24283
MARINE RESOURCES
MIT sea grant: Using the seas to serve people
[COM-75-10269/9] N75-24292
MARINE TECHNOLOGY
Studies and research on marine hulls working with natural ground effect
N75-23475
Summary of synoptic meteorological observations Caribbean and nearby island coastal marine areas. Volume 2: Area 7 - Cayman, area 8 - Jamaica west, area 9 - Jamaica south, area 10 - Jamaica north, area 11 - Jamaica south-east
[AD-A001031] N75-24235
Summary of synoptic meteorological observations Caribbean and near by island coastal marine areas. Volume 4: Areas 18 - Hispaniola north, area 19 - Santo Domingo, area 20 - Mona Passage, area 21 - Puerto Rico south, area 22 - Puerto Rico north, area 23 - Vieques
[AD-A001457] N75-24236
Summary of synoptic meteorological observations. North American coastal marine areas, revised. Atlantic and Gulf Coasts. Volume 1. Revised. Area 1: Belle Isle Strait. Area 2: Osv Bravo. Area 3: NE Newfoundland coast. Area 4: SE Newfoundland coast. Area 5: Placentia Bay south. Area 6: Cabot Strait. Area 7: Anticosti Island
[AD-A006990] N75-24237
Summary of synoptic meteorological observations. Indonesian coastal marine areas, volume 1. Area 1: Southeast Sumatra. Area 2: Christmas Island. Area 3: Sunda Strait. Area 4: Northeast Java Sea. Area 5: Bangka Island northeast. Area 6: Natuna Island. Area 7: Sarawak
[AD-A006923] N75-24242
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 3: Area 12, Hispaniola South; area 13, Windward Passage; area 14, Grand Bahama; area 15, Nassau; area 16, San Salvador; area 17, Acklins Island
[AD-A001912] N75-24244
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 5: Area 24, Virgin Islands; area 25, Leeward Islands; area 26, Winward Islands; area 27, Trinidad; area 28, Barcelona; area 29, Caracas
[AD-A001918] N75-24245
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 6: Area 30, Gulf of Venezuela, area 31, Riohacha; area 32, Cartagena; area 33, Colon; area 34, Gulf of Panama; area 35, Galapagos islands
[AD-A001973] N75-24246
MARINER SPACE PROBES
Mission to the inner planets --- Mariner 10 to investigate Venus and Mercury
[NASA-CR-142828] N75-24629
Venus and Mercury encounters
[NASA-CR-142829] N75-24630
MARINER SPACECRAFT
Magnetic field of the planet Mars based on Mars-3 and Mars-5 satellite data
[NASA-TT-F-16350] N75-24614
MARKET RESEARCH
Country market survey. Avionics and aviation support equipment, Australia
[COM-75-50072-017] N75-24540

MARS [MANNED REUSABLE SPACECRAFT]
Martian atmosphere in the landing site of the descent module of Mars-6 [preliminary results]
[NASA-TT-F-16336] N75-24617

MARS [PLANET]
Investigation of solar plasma near Mars and on Earth-Mars path by means of a charged-particle trap aboard Soviet spacecraft, 1971 - 1973. Part 3: Characteristics of plasma ion and electron components in the antisolar part of near-Martian space measured by Mars-5
[NASA-TT-F-16351] N75-24611
Magnetic field of the planet Mars based on Mars-3 and Mars-5 satellite data
[NASA-TT-F-16350] N75-24614
Polarimetric experiment on board Mars-5
[NASA-TT-F-16348] N75-24619

MARS ATMOSPHERE
Operation of descent module of the Mars-6 automatic interplanetary station in the Martian atmosphere
[NASA-TT-F-16334] N75-23631
Pressures and elevations from CO2 band intensities based on measurements made on board the Mars-5 automatic interplanetary station [preliminary results]
[NASA-TT-F-16346] N75-23671
Measurement of intensity and spectral characteristics of radiation in the Lyman-alpha line in the upper Martian atmosphere
[NASA-TT-F-16339] N75-24612
Preliminary results of measuring water vapor content in planetary atmosphere from measurements on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16337] N75-24613
Experimental measuring composition of Martian atmosphere on board the descent module of the Mars-6 space station
[NASA-TT-F-16335] N75-24616
Martian atmosphere in the landing site of the descent module of Mars-6 [preliminary results]
[NASA-TT-F-16336] N75-24617
Ozone in the planetary atmosphere from measurements on board the Mars-7 automatic interplanetary station
[NASA-TT-F-16338] N75-24618
Spectrophotometry of Mars in the 2-5 micrometer range on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16345] N75-24620
Infrared radiometry on board Mars-5 --- Mars brightness temperature measurements
[NASA-TT-F-16344] N75-24621
Results of investigating the Martian atmosphere by radio-occultation using the Mars-2, Mars-4, and Mars-6 craft
[NASA-TT-F-16341] N75-24624
Preliminary results of two-frequency radio-occultation of the Mars ionosphere by means of Mars planetary probes in 1974
[NASA-TT-F-16340] N75-24625

MARS PROBES
Photometry in the 3200-9000 A range on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16347] N75-23923
Measurements of ion fluxes using RIEP-2801 M instrument on board Mars-4 and Mars-5 automatic interplanetary stations
[NASA-TT-F-16352] N75-24606
Investigation of solar plasma near Mars and on Earth-Mars path by means of a charged-particle trap aboard Soviet spacecraft, 1971 - 1973. Part 3: Characteristics of plasma ion and electron components in the antisolar part of near-Martian space measured by Mars-5
[NASA-TT-F-16351] N75-24611
Preliminary results of measuring water vapor content in planetary atmosphere from measurements on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16337] N75-24613
Preliminary results of research conducted aboard the Soviet Mars-4, Mars-5, Mars-6, and Mars-7 planetary probes
[NASA-TT-F-16333] N75-24615
Ozone in the planetary atmosphere from measurements on board the Mars-7 automatic interplanetary station
[NASA-TT-F-16338] N75-24618
Polarimetric experiment on board Mars-5
[NASA-TT-F-16348] N75-24619
Infrared radiometry on board Mars-5 --- Mars brightness temperature measurements
[NASA-TT-F-16344] N75-24621
Results of geologo-morphological analysis of some photographs of the Martian surface obtained by the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16343] N75-24622
Instrumentation and some results of photographic study on board the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16342] N75-24623
Preliminary results of two-frequency radio-occultation of the Mars ionosphere by means of Mars planetary probes in 1974
[NASA-TT-F-16340] N75-24625
Some results of investigation of solar cosmic rays on board Mars-7 station
[NASA-TT-F-16353] N75-24645

MARS SURFACE
Martian obliterational history
N75-24610
Results of geologo-morphological analysis of some photographs of the Martian surface obtained by the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16343] N75-24622
Instrumentation and some results of photographic study on board the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16342] N75-24623

MARS 2 SPACECRAFT
Results of investigating the Martian atmosphere by radio-occultation using the Mars-2, Mars-4, and Mars-6 craft
[NASA-TT-F-16341] N75-24624

MARS 6 SPACECRAFT
Operation of descent module of the Mars-6 automatic interplanetary station in the Martian atmosphere
[NASA-TT-F-16334] N75-23631
Experimental measuring composition of Martian atmosphere on board the descent module of the Mars-6 space station
[NASA-TT-F-16335] N75-24616
Results of investigating the Martian atmosphere by radio-occultation using the Mars-2, Mars-4, and Mars-6 craft
[NASA-TT-F-16341] N75-24624

MARYLAND
Environmental aspects of run-off and siltation in the Anacostia basin from hyperaltitude photographs
[NASA-TM-X-70888] N75-24067

MASERS
OH and the earliest evolution of H2 regions
N75-24573

MASS SPECTROSCOPY
The application of quadrupole mass spectrometry to nitrogen isotope analysis
N75-23720

MATCHING
Using blossoms to find maximum matchings on graphs
[PB-238971/6] N75-24377

MATERIALS
Catalog of selected NMAB reports
[AD-A007358] N75-24534

MATERIALS TESTS
A users manual for a revised version of the Langley charring ablator program
[NASA-TM-X-72677] N75-23881

MATHEMATICAL MODELS
Investigation of contact between ground surfaces through continuous time series model
N75-24027
A structural dynamics model for flexible solar arrays of the communications technology satellite
[CRC-1268] N75-24034
Development of a three-dimensional time-dependent flow field model
[NASA-CR-120762] N75-24070
Proceedings of seminar on methodology for monitoring the marine environment
[PB-239052/4] N75-24178
Mathematical simulation of smog chamber photochemical experiments
[PB-238094/7] N75-24180
Mathematical simulation of an adsorber for pollutant removal
[PB-239331/2] N75-24194
Analysis of the composition of the atmosphere in the Los Angeles Basin
[PB-239466/6] N75-24199
Automated long range [ANALOG] forecast model
[AD-A007846] N75-24252
A modified parton model for reactions with time-like photons --- comprised of a pair of valence quarks and other particles
[PM/75/4] N75-24457

MATRICES [CIRCUITS]
Solid state camera
[MB/MC-GD-2036/73] N75-23917

MATRICES [MATHEMATICS]
Methods for computing and modifying the LDV factors of a matrix
[NPL-NAC-56] N75-24421
A note on irreducibility for linear operators on partially ordered finite dimensional vector spaces
[PB-239382/5] N75-24426

MAXIMUM LIKELIHOOD ESTIMATES
Estimation of structural dynamic model parameters from transient response data
N75-24022
A method for the estimation of the parameters of a gamma distribution --- stochastic model for tectonic features
[PB-238844/5] N75-24077

MEASURING INSTRUMENTS
The state of the art in oil quality gaging on US military and commercial aircraft
[AD-A007682] N75-23565
Modern analytical measuring instruments
[NASA-TT-F-16394] N75-23929
Generalized characteristics of electrical conductance film thickness gauges
[PB-238949/2] N75-23958
Liquid film thickness measurement: Design and use of a conductance probe
[PB-238950/0] N75-23959

MECHANICAL DEVICES
Control system requirements dictated by optimization of engine operation
N75-23579
Research and development in the field of spacecraft mechanical devices --- collector rings and bearings
N75-24007

MECHANICAL PROPERTIES
Preparation and properties of tungsten-wire reinforced NiCr 80-20
[NASA-TT-F-16275] N75-23696
The use of carbon fibre reinforced plastics in satellite structures. Volume 1: Summary
[HSD-TP-7509-VOL-1-SUMM] N75-23713
Modified ferritic iron alloys with improved high-temperature mechanical properties and oxidation resistance
[NASA-TN-D-7966] N75-23760

MEDICAL PERSONNEL
A multi-disciplinary team for the treatment of patients with defect upper extremities: A need for optimal rehabilitation
[WTHD-67] N75-24325

MEDICAL SERVICES
A multi-disciplinary team for the treatment of patients with defect upper extremities: A need for optimal rehabilitation
[WTHD-67] N75-24325
Health care and satellite radio communication in village Alaska
[PB-238742/1] N75-24343

MENTAL HEALTH
Psychic health: A quantite negligeable in flying fitness examinations
N75-24308

MENTAL PERFORMANCE
Administration of the Rorschach tests to a sample of student pilots training apprenticeship
N75-24299
Changes in visual evoked response by non-visual task processing --- computer programs
N75-24301
On the acceptance, functional gain and mental load in arm prosthesis and orthosis control
[WTHD-66] N75-24355
The lightspot operated typewriter: The evaluation of a prototype
[WTHD-65] N75-24364

MERCURY [METAL]
An oscillating-cup viscometer for high pressure, high temperature mercury
N75-23916

MERCURY [PLANET]
Perturbation of a planetary orbiter by radiation pressure, account being taken of variation in the distance and direction of the sun
[ESRO-SR-24-ESOC] N75-23639
Innermost planets of the solar system
[NASA-CR-142827] N75-24627
Venus and Mercury as planets
[NASA-CR-142826] N75-24628
Mission to the inner planets --- Mariner 10 to investigate Venus and Mercury
[NASA-CR-142828] N75-24629
Venus and Mercury encounters
[NASA-CR-142829] N75-24630

MERCURY PROJECT
History of manned space flight
[NASA-TM-X-66817] N75-24641

MERGING ROUTINES
Lower bounds on merging networks
[PB-238554/0] N75-23855

MESAS
Electron beam semiconductor device with mesa diode, reliability and failure determination
[AD-A007277] N75-23860

MESOSPHERE
The role of ice particulates in the electrification of the air in the mesosphere --- using OGO 6 data
N75-24202

METABOLIC WASTES
Conversion of cattle feedlot wastes to ammonia synthesis gas
[PB-239668/7] N75-23692

METABOLISM
Role of metabolic shifts in the pathogenesis of vestibular disturbances
[NASA-TT-F-16431] N75-24327
Properties of uvrE mutants of Escherichia coli K12. Part 1: Effects of UV irradiation on DNA metabolism
[MBL-1974-25] N75-24332

METAL CRYSTALS
Effect of a long range interatomic potential on the stability of crystal lattices
[LBL-3151] N75-23767

METAL FATIGUE
Report of NRL progress --- including metal fatigue, radio communication, and ionospherics
[PB-238839/5] N75-24664

METAL FILMS
Field ion microscopic study of films of molybdenum, platinum and tantalum vapor deposited on tungsten
N75-23747
Electron tunneling in semimetallic films
N75-24490
METAL FINISHING
Surface finishing --- particularly for use in smoothing irregularities on aluminum aircraft wings
[NASA-CASE-MSC-12631-1] N75-23476
METAL FOILS
DT fusion neutron irradiation of ORNL magnesium oxide crystal, BPNL molybdenum, LLL copper tensile specimens, LLL machinable glass ceramic, and UW/LLL high purity metallic foils
[UCID-16665] N75-24443
METAL HYDRIDES
Complex metal hydrides: High energy fuel components for solid propellant rocket motors
[AD-A007353] N75-23779
METAL MATRIX COMPOSITES
Plasticity theory of fiber-reinforced metal matrix composites
N75-23694
Possible utilization of electron scan microscope for the study of composite materials with organic matrix
N75-23708
Elevated temperature morphological stability of metal matrix fiber composites
[ORO-3947-11] N75-23712
Mechanical properties of aluminum alloy-graphite fiber composites --- metal matrix composites
[AD-A007779] N75-23715
METAL OXIDE SEMICONDUCTORS
Complementary MOS transistors in micropower circuits
[AD-A007272] N75-23859
Total-dose radiation-hardened COS/MOS integrated circuits
[AD-A007618] N75-23861
Solid state camera
[MB/MC-GD-2036/73] N75-23917
Application of the MOS-C-V technique to determine impurity concentrations and surface parameters on the diffused face of silicon solar cells
[NASA-TM-X-71721] N75-24505
METAL PLATES
Fracture mechanics of metallic structures
N75-24028
Stress concentration in an expanded plate with opening reinforced by central belt
[AD-A007672] N75-24044
METAL SHELLS
Fracture mechanics of metallic structures
N75-24028
METAL SURFACES
Morphological growth of sputtered MoS2 films
[NASA-TM-X-71742] N75-24507
METAL WORKING
Translations on eastern Europe: Scientific affairs, no. 464 --- metal working, theoretical physics, computer techniques
[JPRS-64751] N75-24655
New technologies in metallurgy studied by Research Institute
N75-24656
METALLOIDS
Electron tunneling in semimetallic films
N75-24490
METALS
Anomalous Hall effect in metals with small concentrations of localized magnetic defects
N75-23750
METEORITE COLLISIONS
Compaction by impact of unconsolidated lunar fines
[NASA-CR-142877] N75-24638
METEORITE CRATERS
Martian obliterational history
N75-24610
METEORITIC DAMAGE
Compaction by impact of unconsolidated lunar fines
[NASA-CR-142877] N75-24638
METEOROLOGICAL INSTRUMENTS
French participation in the EXAMETNET program operational implementation
[NASA-TT-F-16388] N75-24230
METEOROLOGICAL PARAMETERS
Summary of synoptic meteorological observations Caribbean and near by island coastal marine areas. Volume 4: Areas 18 - Hispaniola north, area 19 - Santo Domingo, area 20 - Mona Passage, area 21 - Puerto Rico south, area 22 - Puerto Rico north, area 23 - Vieques
[AD-A001457] N75-24236
Bermuda environmental scenario
[AD-A007448] N75-24253
The 03702 Honest John Missile No. 1005, round no. 645 AML
[AD-A007462] N75-24254
Atmospheric structure. Part 3: Upper air and surface data: Holloman Site
[AD-A007468] N75-24255
METEOROLOGICAL SATELLITES
Weather satellite picture receiving stations, APT digital scan converter
[NASA-TN-D-7994] N75-24231
Defense Meteorological Satellite Program [DMSP]: User's guide
[AD-A007678] N75-24256
METEOROLOGICAL SERVICES
Operations of the National Weather Service, 1974
[COM-75-10194/9] N75-24239
METEOROLOGY
Soviet bloc research in geophysics, astronomy, and space, no. 348
[JPRS-64770] N75-24662
MICA
Determination of fluoride in fluomica and fluomica-alumina composites with the fluoride electrode
[AD-A007764] N75-23736
MICHIGAN
Socio-psychological aspects of transportation, a background/resource paper for the Upper Great Lakes University Consortium for Transportation Research
[PB-238938/5] N75-24552
MICROBALANCES
Method for continuous torque measurement of dry miniature bearings --- using microbalance
N75-24006
MICROBIOLOGY
Biological experiments on Salyut-4
[NASA-TT-F-16267] N75-24321
MICROCRACKS
Electron microscopic observations of microcracking about indentations in aluminum oxide and silicon carbide
[AD-A007445] N75-23794
MICROELECTRONICS
Plane micromodules
[AD-A007854] N75-23865
MICROMINIATURIZATION
Plane micromodules
[AD-A007854] N75-23865
MICROMODULES
Plane micromodules
[AD-A007854] N75-23865
MICROORGANISMS
Studies on possible propagation of microbial contamination in planetary atmospheres
[NASA-CR-142825] N75-24296
MICROPHONES
Study of a porous surface microphone sensor in an aerofoil --- air flow
[NASA-CR-137652] N75-23932
MICROSTRUCTURE
Structure and properties of steels theromomechanically processed by impact extrusion
[AEC-IS-T-652] N75-23746
Effect of neutron irradiation on the microstructure and properties of titanium-stabilized type 316 stainless steels
[ORNL-TM-4731] N75-23973
MICROWAVE AMPLIFIERS
Solid state amplifier for spread spectrum communications
[AD-A007789] N75-23858
MICROWAVE CIRCUITS
Complementary MOS transistors in micropower circuits
[AD-A007272] N75-23859
MICROWAVE EQUIPMENT
Reliability study of microwave power transistors
[AD-A007788] N75-23863
Long term reliability investigations of the MSC-1330 microwave power transistor and the AMPAC 1214-30 internally matched device
[AD-A007354] N75-23866
MICROWAVE FREQUENCIES
Analysis of central nervous system involvement
[AD-A007581] N75-24345
Measurement of absorbed power patterns in the head and eyes of rabbits exposed with typical microwave sources
[AD-A007524] N75-24346
Electrophysiological effects of electromagnetic fields on animals --- radiation effects of microwaves on nervous system
[AD-A007520] N75-24347
Microwave transient response measurements of elastic momentum transfer collision frequency
[ORO-3027-26] N75-24444
MICROWAVE HOLOGRAPHY
Microwave holography for analysis of conformal arrays --- antenna radiation patterns
[AD-A007359] N75-23953
MICROWAVES
Quantitation of microwave radiation effects on the eyes of rabbits at 2450 MHz and 918 MHz
[AD-A007521] N75-24344
Biologic effects and health hazards of microwave radiation
[PB-239554/9] N75-24352
MIGRATION
Utilization of Skylab EREP system for appraising changes in continental migratory bird habitat --- using multispectral band scanner
[E75-10281] N75-24054
MILITARY AIR FACILITIES
Radar station evaluation report, Pease AFB, New Hampshire
[AD-A007041] N75-23553
Air Force Flight Test Center technology needs. Annual report for calendar year 1974
[AD-A007840] N75-23616
An interdisciplinary engineering approach to a facility design study with emphasis on energy conservation. Volume 2: Main report text
[AD-A006804] N75-24129
MILITARY AIRCRAFT
Effect of external conditions on the functioning of a dual flow supersonic nozzle --- designing propulsion system of military aircraft
N75-23491
Accounting of aerodynamic forces on airframe/propulsion systems --- for designing military aircraft
N75-23507
MILITARY PSYCHOLOGY
Medical requirements and examination procedures in relation to the tasks of today's aircrew: Comparison of examination techniques in neurology, psychiatry and psychology with special emphasis on objective methods and assessment criteria
[AGARD-CP-153] N75-24297
Test for quick and early detection of psychic syndromes more frequent in the Air Force personnel
N75-24298
Standardization of objective medico-psychiatric questionnaire in the French Army
N75-24307
Psychic health: A quantite negligeable in flying fitness examinations
N75-24308
Sixteen years experience in military aviation psychiatry and neurology --- pilot selection
N75-24309
MILITARY TECHNOLOGY
Report of NRL progress --- including fracture mechanics, plasma physics, underwater acoustics, and radio communication
[PB-238901/3] N75-24663
Report of NRL progress --- including metal fatigue, radio communication, and ionospherics
[PB-238839/5] N75-24664
MILLIMETER WAVES
One millimeter observations of H2 regions --- to establish mean spectral index in submillimeter region
N75-24568
MINERAL DEPOSITS
Assessment of uranium and thorium resources in the United States and the effect of policy alternatives
[PB-238658/9] N75-24133
MINERAL EXPLORATION
Assessment of uranium and thorium resources in the United States and the effect of policy alternatives
[PB-238658/9] N75-24133
MINERAL OILS
X-ray analysis of metal traces in petroleums using ion exchange membranes
[NASA-TT-F-16288] N75-23724
MINES [EXCAVATIONS]
High-capacity transport planes as modern air freight systems
[NASA-TT-F-16396] N75-23533
Electromagnetic noise in McElroy Mine
[COM-74-11717/7] N75-23826
Design optimization in underground coal systems
[PB-239075/5] N75-24153
MINIATURE ELECTRONIC EQUIPMENT
Investigation of new dielectrics for miniaturized high-performance capacitors
[NASA-TT-F-16383] N75-24506
MINICOMPUTERS
Remote-terminal emulator [design verification model]: Introduction and summary
[AD-A007827] N75-24376
Microprocessors in computing --- floating point arithmetic
[UCRL-76234] N75-24385
MINIMAX TECHNIQUE
On minimax decision theory: A Banach space approach
N75-24525
MIRRORS
Fabrication of experimental three-meter space telescope primary and secondary mirror support structure
[NASA-CR-143796] N75-23986
MISSILE BODIES
Aerodynamic characteristics of an axisymmetric body undergoing a uniform pitching motion
[AD-A007553] N75-23523
MISSILE RANGES
Report of the Army Scientific Advisory Pannel ad hoc group on White Sands Missile Range instrumentation
[AD-A007836] N75-23643
MISSILE TRAJECTORIES
Prediction of rotor wake induced flow along the rocket trajectories of an Army AH-1G helicopter
[AD-A007878] N75-23528

MISSILES
Engine control for harpoon missile system
N75-23580
MISSION PLANNING
The Apollo-Soyuz test flight
[NASA-TT-F-16386] N75-23621
Astrionic system optimization and modular astrionics for NASA missions after 1974. Preliminary definition of astrionic system for space tug Mission Vehicle Payload [MVP]
[NASA-CR-120618] N75-23627
MISSOURI
Saint Louis aviation forecast study: Executive summary
[PB-239055/7] N75-23538
MOIRE EFFECTS
Shape and dimensional control of tridimentional objects --- Moire effects and imaging techniques
N75-24464
MOISTURE CONTENT
Ground truth procedures, Phoenix soil moisture
[NASA-CR-143795] N75-24066
Preliminary results of measuring water vapor content in planetary atmosphere from measurements on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16337] N75-24613
MOJAVE DESERT [CA]
Fault tectonics and earthquake hazards in the Peninsular Ranges, Southern California --- Mojave Desert
[E75-10284] N75-24057
Identification and interpretation of tectonic features from Skylab imagery --- Mojave Desert and San Bernardino Mountains, California
[E75-10288] N75-24061
MOLECULAR ABSORPTION
An automated molecular fluorescence/absorption sequential analyzer with laser source
N75-23911
MOLECULAR ENERGY LEVELS
A tunable dye laser diagnostic facility --- optical pumping and molecular energy levels
[AD-A007620] N75-23979
MOLECULAR EXCITATION
Study and application of pulsed CO2 lasers --- noting excitation by electric discharges and electron beam
N75-23808
MOLECULAR PHYSICS
Molecular mechanics of polymers by dynamic infrared techniques
N75-23786
MOLECULAR SPECTRA
TIMAVI: A computer program to time-average repetitively scanned digitized spectra --- nuclear magnetic resonance
[AD-A007849] N75-23733
Expected infrared molecular lines from the galactic centre
N75-24591
MOLECULAR STRUCTURE
Chemical evolution
[LBL-3319] N75-24369
MOLNIYA SATELLITES
Experiment definition phase shuttle laboratory LDRL-10.6 experiment --- using a molniya satellite and ground communication links
[NASA-CR-143746] N75-23652
MOLTEN SALT ELECTROLYTES
Diffusion layers formed in salt media and molten oxides --- using spontaneous or electrolytic deposit techniques
[NASA-TT-F-16381] N75-23757
MOLYBDENUM
Field ion microscopic study of films of molybdenum, platinum and tantalum vapor deposited on tungsten
N75-23747
Friction of the couples copper-copper, molybdenum-molybdenum, copper-molybdenum and copper-nickel in the ultrahigh vacuum
N75-24002
MOLYBDENUM SULFIDES
Morphological growth of sputtered MoS2 films
[NASA-TM-X-71742] N75-24507
MOMENTUM TRANSFER
Microwave transient response measurements of elastic momentum transfer collision frequency
[ORO-3027-26] N75-24444
MONATOMIC GASES
Behavior of atomic H in solid H2 from 0.2 to 0.8 K
[NASA-TM-X-71732] N75-24440
MONOPROPELLANTS
An analysis of droplet size distribution during monopropellant spray combustion
N75-23799
MONTE CARLO METHOD
Spherical cavity in a free molecular flow --- numerical analysis using the Monte Carlo method
[AD-A007290] N75-23899
MOON
New look of the old moon --- exploration of the moon since 1959
[NASA-TT-F-16253] N75-24640
MORPHOLOGY
Several question of the phylogeny and system of lacertilia [seu sauria]
[NASA-TT-F-16354] N75-24295
MOSSBAUER EFFECT
On the question of induced Mossbauer gamma radiation --- laser applications
N75-23966
Questions of the kinetics of stimulated gamma radiation --- resonant frequencies and the Mossbauer effect
N75-23967
MOTION
Wave induced motions and loads on ships in oblique waves
[REPT-193-S] N75-23810
MOTION PICTURES
On the visibility of luminance fluctuations in television pictures, and exposure variations in motion picture film
[BBC-RD-1975/13] N75-23819
MOUNTAINS
Identification and interpretation of tectonic features from Skylab imagery --- Mojave Desert and San Bernardino Mountains, California
[E75-10288] N75-24061
Effects of meso-scale and small scale interactions on global climate Volume 1: Orographic effects on global climate
[AD-A007034] N75-24247
Meso-scale and small-scale interactions on global climate. Volume 2: Radiation transport effects on global climate
[AD-A007035] N75-24248
MULTIPATH TRANSMISSION
UHF multipath phenomena in a marine environment
[COM-75-10266/5] N75-23841
MULTIPLEXING
Digital transmission evaluation project. RDS-80 test
[AD-A007111] N75-23839
MULTIPLIERS
Efficiency and weight of voltage multiplier type ultra lightweight dc-dc converters
[NASA-TM-X-71735] N75-23851
MULTIPROCESSING [COMPUTERS]
Hardware-software interactions in SYMBOL-2R's operating system
[PB-239220/7] N75-24378
Optimal scheduling of homogeneous job systems
[PB-238972/4] N75-24402
MULTIPROGRAMMING
Optimal scheduling of homogeneous job systems
[PB-238972/4] N75-24402
Deadlock in distributed computer networks --- multiprogramming and resource allocation
[PB-238943/5] N75-24412
MULTISPECTRAL BAND SCANNERS
Multispectral aerial reconnaissance of parasitic attacks in forests: Remote sensing --- in France
N75-24052
Utilization of Skylab EREP system for appraising changes in continental migratory bird habitat --- using multispectral band scanner
[E75-10281] N75-24054
Developing processing techniques for Skylab data --- using multispectral scanner
[E75-10289] N75-24062
Mid-infrared spectral behavior of igneous rocks
[AD-A007680] N75-24083
MULTISPECTRAL PHOTOGRAPHY
Broadband spectral photography of the James River
[NASA-TM-X-72689] N75-24068
Investigation of multispectral techniques for remotely identifying terrain features and natural materials
[PB-238675/3] N75-24078
MULTISTAGE ROCKET VEHICLES
Analysis of problems in rocket base heat transfer during the aspiration phase
N75-23675
MULTIVARIATE STATISTICAL ANALYSIS
Impact of multivariate analysis on the aviation selection and classification process
N75-24306
MUONS
The charge ratio of ultra high energy cosmic ray muons
N75-24649
MUSCLES
The innervation of chick striated muscle fibres by the chick ciliary ganglion in tissue culture
[MBL-1974-33] N75-24338
MUSCULAR TONUS
Effects of muscular exercise on variation in plasma cortisol and glucose in normal males
[NASA-TT-F-16257] N75-24326
MUTATIONS
Properties of uvrE mutants of Escherichia coli K12. Part 1: Effects of UV irradiation on DNA metabolism
[MBL-1974-25] N75-24332
Properties of uvrE mutants of Escherichia coli K12. Part 2: Construction and properties of pol and rec derivatives
[MBL-1974-26] N75-24333
Mutagenesis by ultraviolet radiation in bacteriophage PHI X 174: On the mutation stimulating processes induced by ultraviolet radiation in the host bacterium
[MBL-1974-30] N75-24335
MYLAR [TRADEMARK]
Influence of a strong static electrical field on the absorption spectrum of mylar polyester
[AD-A007864] N75-23795

N

N-P-N JUNCTIONS
Properties and potential of BARITT devices --- barrier injection transit time devices
N75-24491
NACELLES
The influence of nacelle afterbody shape on airplane drag
N75-23505
Prediction of the optimum location of a nacelle shaped body on the wing of a wing-body configuration by inviscid flow analysis
N75-23510
Conceptual design study of advanced acoustic composite nacelle --- for achieving reductions in community noise and operating expense
[NASA-CR-132649] N75-23568
Thrust/drag analysis for a front fan nacelle having two separate co-axial exhaust streams
[ARC-CP-1311] N75-23574
Aircraft engine nacelle fire test simulator
[AD-A007853] N75-23617
NASA PROGRAMS
Department of Housing and Urban Development-independent agencies appropriations for 1976. Part 2: National Aeronautics and Space Administration
[GPO-51-423] N75-24542
NATURAL GAS
Vulnerability of natural gas systems --- industrial management and operations
[AD-A007583] N75-24143
NATURAL SATELLITES
Jupiter and planet Earth --- planetary and biological evolution and natural satellites
[NASA-TM-X-66829] N75-24633
NAVIER-STOKES EQUATION
One class of the exact solutions of the equations of Navier-stokes for unsteady flow of the compressible gas in channels
[AD-A007402] N75-23903
Exact solutions of the equations of Navier-Stokes for the flow of the compressible gas in channels
[AD-A007683] N75-23908
NAVIGATION AIDS
A Kalman filter for the Stoland system
[NASA-CR-137668] N75-23543
NEAR FIELDS
The distribution of jet source strength intensity by means of a direct correlation technique --- far and near fields
N75-23872
NEAR INFRARED RADIATION
On the structure of M17S --- behavior of 9.7 micron band due to dust particles
N75-24563
NEBULAE
The Orion nebula: A photographic study of spatial structure
N75-24556
Optical observations of a few small H2 regions detected at infrared wavelengths --- density and brightness distribution
N75-24557
NGC 7635 and its stellar nucleus --- emphasizing infrared data
N75-24558
Optical, infrared and radio observations of two H2 regions
N75-24559
Compact infrared sources associated with southern H2 regions
N75-24560
Infrared observation of NGC 6334
N75-24561
On the structure of M17S --- behavior of 9.7 micron band due to dust particles
N75-24563
Wide beam measurements of H2 regions in the infrared
N75-24564
Far infrared observations of W51 and the galactic centre --- balloon-borne telescope system
N75-24566
One millimeter observations of H2 regions --- to establish mean spectral index in submillimeter region
N75-24568
New observations of H2 regions at 7.875, 15.5, 31.4, or 85 GHz
N75-24569
Radio recombination lines from carbon and heavier elements from the direction of NGC 2024
N75-24572

An empirical model for the structure of the Orion nebula
N75-24574
Dust in H2 regions --- theoretical models of dusty nebulae
N75-24577
Ionisation structure and transfer of radiation in dusty nebulae
N75-24578
The gas-to-dust ratio in the Orion nebula
N75-24581

NEEL TEMPERATURE
Computing programme for a two sublattice neel ferrimagnet, application to the rareearth compounds
[IFA-SR-9-1974] N75-23770

NEODYMIUM ALLOYS
Magnetic properties of neodymium-samarium-cobalt alloys
[AD-A007848] N75-24520

NEON
Recent observations of the 8-13 micron spectra of H2 regions
N75-24562

NEPTUNIUM COMPOUNDS
High field susceptibility in ferromagnetic NpOs2
[CONF-741057-3] N75-24510

NERVOUS SYSTEM
Electrophysiological effects of electromagnetic fields on animals --- radiation effects of microwaves on nervous system
[AD-A007520] N75-24347

NETWORK ANALYSIS
Description of computer network analysis model --- used computerized simulation
[AD-A007417] N75-24410
Deadlock in distributed computer networks --- multiprogramming and resource allocation
[PB-238943/5] N75-24412

NETWORK SYNTHESIS
NOR network transduction procedures: Merging of gates and substitution of gates for fan-in and fan-out restricted networks [NETTRA-G3-FIFO and NETTRA-PG1-FIFO]
[PB-238944/3] N75-24401

NETWORKS
Brooknet: A high speed computer network --- data transmission
[BNL-19365] N75-24409
Study of a group of documentation systems in order to determine the interconnection and the exchange possibilities at the level of sectorial networks and to recommend the means necessary for this harmonization
N75-24530

NEUROLOGY
Medical requirements and examination procedures in relation to the tasks of today's aircrew: Comparison of examination techniques in neurology, psychiatry and psychology with special emphasis on objective methods and assessment criteria
[AGARD-CP-153] N75-24297
Sixteen years experience in military aviation psychiatry and neurology --- pilot selection
N75-24309

NEUROMUSCULAR TRANSMISSION
An alternative therapy against organophosphate poisoning
[MBL-1974-32] N75-24337

NEUTRON DIFFRACTION
Neutron diffraction studies of deuterium solid structures and transitions
[LA-UR-74-1716] N75-23788

NEUTRON IRRADIATION
Effect of neutron irradiation on the microstructure and properties of titanium-stabilized type 316 stainless steels
[ORNL-TM-4731] N75-23973
Irradiation effects on reactor structural materials
[HEDL-TME-74-51] N75-24038
DT fusion neutron irradiation of ORNL magnesium oxide crystal, BPNL molybdenum, I.I.I. copper tensile specimens, I.I.I. machinable glass ceramic, and UW/I.I.I. high purity metallic foils
[UCID-16665] N75-24443

NEUTRON SCATTERING
Neutron scattering and magnetization measurements on the Kondo compound CeAl3
[CONF-741202-13] N75-24450

NEW ENGLAND [US]
The use of ERTS imagery in reservoir management and operation --- New England
[E75-10286] N75-24059

NEWS MEDIA
Apollo Soyuz test project press kit: USA-USSR
[NASA-NEWS-RELEASE-75-118] N75-23623

NICKEL
Friction of the couples copper-copper, molybdenum-molybdenum, copper-molybdenum and copper-nickel in the ultrahigh vacuum
N75-24002

NICKEL ALLOYS
Evaluation of dispersion strengthened nickel-base alloy heat shields for space shuttle application
[NASA-CR-132615] N75-23667
Preparation and properties of tungsten-wire reinforced NiCr 80-20
[NASA-TT-F-16275] N75-23696
Examination of the influence of coatings on thin superalloy sections. Volume 2: Detailed procedures and data --- corrosion resistance
[NASA-CR-134792] N75-23756

NICKEL CADMIUM BATTERIES
The evaluation of NiCd cell covers. Part 1: Text and tables --- on circular and rectangular covers
[NLR-TR-74116-C-PT-1] N75-24016
The evaluation of NiCd cell covers. Part 2: Figures --- on circular and rectangular covers
[NLR-TR-74116-C-PT-2] N75-24017
Experimental investigation and model development of the Skylab ATM secondary nickel-cadmium batteries
[NASA-CR-120749] N75-24097

NICKEL PLATE
Variation of solar-selective properties of black chrome with plating time
[NASA-TM-X-71731] N75-23753

NIOBIUM
Critical current density in superconducting niobium films
[CONF-740957-21] N75-24509
Effect of surface metallurgy on the penetration depth and RF breakdown field of superconducting niobium
[BNL-19276] N75-24512
Electronic tunneling and structure of superconducting niobium single crystals
[AD-A007580] N75-24515

NIOBIUM ALLOYS
Interstitial relaxations due to hydrostatic stress in niobium-oxygen alloys
N75-23743

NIOBIUM STANNIDES
Effect of metallurgical history on Jc[5T] in surface diffused multifilamentary Nb3Sn
[BNL-19271] N75-24511

NITROGEN
Infra-Red lasers and infra-red spectra of free radicals
[AD-A007720] N75-23978
An investigation of odd nitrogen in the ionospheric E region
N75-24204
Atmospheric phenomena --- auroras, electron states, nitrogen, nitrogen oxides
[AD-A007792] N75-24218
The investigation of O and N2 densities from the OSO-7 extreme UV data
[NASA-CR-142759] N75-24644

NITROGEN ISOTOPES
The application of quadrupole mass spectrometry to nitrogen isotope analysis
N75-23720

NITROGEN OXIDES
Comprehensive technical report on all atmospheric contaminants associated with photochemical air pollution
[PB-239510/1] N75-24197
Atmospheric phenomena --- auroras, electron states, nitrogen, nitrogen oxides
[AD-A007792] N75-24218

NOAA 2 SATELLITE
Satellite infrared soundings from NOAA spacecraft --- to measure temperature and humidity
[COM-75-10256/6] N75-24260

NOISE [SOUND]
Full scale upper surface blown flap noise
[NASA-TM-X-71708] N75-23569
Noise generation in transonic wind tunnels
[AD-A007688] N75-23614
Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety
[PB-239429/4] N75-24351

NOISE GENERATORS
Noise generation in transonic wind tunnels
[AD-A007688] N75-23614

NOISE POLLUTION
The development of experimental techniques for the study of helicopter rotor noise
[NASA-CR-137684] N75-23611
Noise abatement
[TT-73-50040] N75-24193
Sound and vibration measurements for Concorde supersonic transport and subsonic jet aircraft
[PB-238748/8] N75-24436

NOISE PROPAGATION
Problems in nonlinear mechanics of unstable waves in turbulent and in stratified shear flows. Part 1: Development of the noise-producing large-scale structure in a turbulent jet. Part 2: Nonlinear KelvinHelmholtz waves and the vertical mixing mechanism in a stratified shear flow. Part 3: Nonlinear interactions of the large-scale coherent structure and turbulence in a free shear flow
N75-23874
An experimental investigation of the turbulent characteristics of co-axial jet flows and their role in aerodynamic noise generation
N75-24161

NOISE REDUCTION
A study of helicopter interior noise reduction
[NASA-TM-X-72655] N75-23556
CF5D aircraft cockpit-noise reduction
[DCIEM-74-R-1048] N75-23564
Conceptual design study of advanced acoustic composite nacelle --- for achieving reductions in community noise and operating expense
[NASA-CR-132649] N75-23568
NASA refan program status --- for noise reduction of JT8D turbofan engine
[NASA-TM-X-71705] N75-23570
Civil aviation studies and interagency coordinating organizations, volume 1 --- aircraft noise reduction
[PB-239344/5] N75-24186
Civil aviation studies and interagency coordinating organizations, volume 2: Appendices --- aircraft noise reduction
[PB-239345/2] N75-24187
Noise abatement
[TT-73-50040] N75-24193
A digital algorithm for spectral deconvolution with noise filtering and peak picking: NOFIPP-DECON
[NASA-TM-X-64927] N75-24383
Improved suppression of radiation from automobiles used by the general public
[PB-239471/6] N75-24553

NOISE TOLERANCE
Human temporary threshold shift and recovery from 24 hour acoustic exposures
[AD-A007842] N75-24350
Psychophysical tests of potential design/certification criteria for advanced supersonic aircraft --- human noise tolerance
[AD-A009296] N75-24354

NONDESTRUCTIVE TESTS
Failure analysis of electronic parts: Laboratory methods --- for destructive and nondestructive testing
[NASA-SP-6508] N75-23853
Nondestructive holographic techniques for structures inspection
[AD-A007850] N75-23946
Characterization of implanted silicon by Raman and infrared spectrocopy
N75-24013
Field evaluation of void spacing indicator --- reliability control of concrete pavements
[PB-239044/1] N75-24019
Thermal loading in the laser holography nondestructive testing of a composite structure
[NASA-TR-R-439] N75-24035

NONEQUILIBRIUM FLOW
Effect of nonequilibrium processes on the gasdynamic parameters in hypersonic installations and in the critical point of a blunted body
[AD-A007414] N75-23904

NONEQUILIBRIUM IONIZATION
Calculation of rotational nonequilibrium in a pulsed HF laser
[UCRL-75814] N75-23969

NONLINEAR SYSTEMS
Development of chalcopyrite crystals for nonlinear optical applications
[AD-A007838] N75-24469

NONLINEARITY
Problems in nonlinear mechanics of unstable waves in turbulent and in stratified shear flows. Part 1: Development of the noise-producing large-scale structure in a turbulent jet. Part 2: Nonlinear KelvinHelmholtz waves and the vertical mixing mechanism in a stratified shear flow. Part 3: Nonlinear interactions of the large-scale coherent structure and turbulence in a free shear flow
N75-23874
Nonlinear vibration of three-layer beams
N75-24024
Nonlinear wave propagation in heterogenious anisotropic plates
N75-24428

NONUNIFORM FLOW
Linear conversion and parametric instabilities in a nonuniform plasma
[AD-A007259] N75-24487

NOSE CONES
An experimental investigation of the aerodynamic characteristics of several nose mounted canard configurations at supersonic Mach numbers
[AD-A007793] N75-23526

NOSE WHEELS
The effect of chine tires on nose gear water-spray characteristics of a twin engine airplane
[NASA-TM-X-72695] N75-23555

NOVAE
Theoretical emission line profiles for Novae
N75-24602

NOZZLE DESIGN
Experimental study of the axisymmetric shaped hypersonic nozzles
[AD-A007471] N75-23517

NOZZLE FLOW
Isplating nozzle afterbody interaction parameters and size effects: A new approach --- flight and wind tunnel tests with A 7 aircraft
N75-23503

Airframe/propulsion system flow field interference and the effect on air intake and exhaust nozzle performance
N75-23508
Critical flow and pressure ratio data for LOX flowing through nozzles
[NASA-TM-X-71725] N75-23883
NOZZLE GEOMETRY
On some problems encountered in a theoretical study of the external flow over a nozzle configuration in transonic flight
N75-23499
NUCLEAR AUXILIARY POWER UNITS
Artificial heart controls support
[ORO-4485-2] N75-24365
NUCLEAR ELECTRIC POWER GENERATION
A preliminary technology assessment of ocean thermal gradient energy generation
[PB-238646/4] N75-24147
NUCLEAR ENERGY
Energy Reorganization Act of 1974 --- the Energy Research and Development Administration and Nuclear Energy Commission
[S-REPT-93-1252] N75-24123
Evaluation of power facilities; A reviewer's handbook --- electric and nuclear power plants
[PB-239221/5] N75-24198
NUCLEAR EXPLOSIONS
Project Rio Blanco: Project scientist's summary report of production test data and preliminary analysis of top chimney/cavity --- gas and radioactive analysis
[UCRL-76280] N75-24452
NUCLEAR FUEL ELEMENTS
Metallurgy Department
[RISO-304] N75-23771
NUCLEAR MAGNETIC RESONANCE
TIMAVI: A computer program to time-average repetitively scanned digitized spectra --- nuclear magnetic resonance
[AD-A007849] N75-23733
Nuclear magnetic resonance studies of glasses and related crystalline materials
N75-23784
Organic analysis by nuclear magnetic resonance
[NASA-TT-F-16276] N75-24446
Nuclear magnetic resonance studies of solid hydrogen under high pressure
N75-24498
NUCLEAR PARTICLES
Multiparticle production in the interactions of charged cosmic ray hadrons with nuclear targets
N75-24651
NUCLEAR REACTIONS
Report on the Brookhaven solar neutrino experiment
[BNL-19278] N75-24652
NUCLEAR REACTOR CONTROL
Controllability of a steady-state Tokamak fusion reactor
[CONF-741086-9] N75-24453
NUCLEAR RESEARCH
Space and nuclear research and technology
[NASA-NEWS-RELEASE-75-95] N75-23619
Standard reference materials: The role of SRM's in measurement systems --- in nuclear engineering and chemistry
[COM-75-50070/2] N75-23941
NUCLEAR WARFARE
READY 1 system for the UNIVAC 1108 weapons effect program
[PB-239293/4] N75-24666
READY 1 system for the UNIVAC 1108 weapons preparation program
[PB-239294/2] N75-24667
READY 1 system for the UNIVAC 1108 attack conditions program
[PB-239295/9] N75-24668
NUCLEASE
A changed ATP-dependent DNAase: The characterization of the enzyme from Escherichia coli rorA
[MBL-1974-38] N75-24314
Purification and characterization of an endonuclease from calf thymus acting on irradiated DNA
[MBL-1974-35] N75-24340
NUCLEATION
Void nucleation and growth in heavy ion and electron bombarded pure metals --- considering He influence
[COO-2206-5] N75-23763
NUCLEI
Cavitation inception thresholds in water and nuclei spectra by light scattering technique
[PB-238448/5] N75-23895
NUCLEI [NUCLEAR PHYSICS]
Comparison of two nucleus spectrum measuring devices and the influence of several variables on cavitation threshold in water
N75-23915
Rotating, charged or gravitating liquid drop, and problems in nuclear physics and astronomy
[LBL-3363] N75-24451
NUMERICAL ANALYSIS
Computational techniques for boundary layers
[SAND-74-5821] N75-24420
Time dependent accretion disks around compact objects, part 1. Theoretical frameworks for analyzing and testing gravitation theories, part 2
N75-24604
NUMERICAL CONTROL
Numerical control of a turbomachine
N75-23590
Simulation techniques for turbomachines
N75-23591
Direct digital numerical controller for machine tools
[Y-1966] N75-24373
NUMERICAL INTEGRATION
Solution of simultaneous partial differential equations: An extension of PDEL
[PB-239432/8] N75-24405
NYLON [TRADEMARK]
Characterization of nylon 66-poly[ethylene glycol] blend fibers
N75-23785

O

O STARS
Galactic structure at l 2 equals 40 deg --- noting OB star distribution due to occultation by galactic dust
[SBN-902553-11-9] N75-24609
OAO 3
Copernicus observations of Betelgeuse and Antares
[NASA-CR-142815] N75-24598
OBLIQUE COORDINATES
Wave induced motions and loads on ships in oblique waves
[REPT-193-S] N75-23810
OCEAN BOTTOM
On bottom density currents on the continental shelves
N75-24281
OCEAN CURRENTS
Evaluation of the Expendable Surface Current Probe [ESCP]
[AD-A007877] N75-23943
Physical nature of the climatic and biological effects of the Peru current
N75-24279
On bottom density currents on the continental shelves
N75-24281
Analysis of ERTS-A satellite photos for NOAA-AOML study to detect ocean eddies [sic]
[COM-75-10192/3] N75-24282
Wave height indicators
[COM-75-10140/2] N75-24289
Tides and tidal currents of Narragansett Bay
[COM-75-10250/9] N75-24290
Variability of tidal datums and accuracy in determining datums from short series of observations
[COM-75-10275/6] N75-24291
OCEAN SURFACE
Passive ranging with wavefront sampling
[AD-A007387] N75-23836
Evaluation of the Expendable Surface Current Probe [ESCP]
[AD-A007877] N75-23943
Recent changes in the ocean level
N75-24263
Drift current in a thin surface layer of the ocean
N75-24265
The D sub m[kappa, alpha 1..., alpha sub m function in the ocean-continent transfer problem
N75-24269
Distribution of energy in the ocean and atmosphere as a result of their thermal and dynamic interactions
N75-24280
Laboratory investigation of internal wave generation models --- surface tides transfer energy to internal waves at continental shelf breaks
[AD-A007351] N75-24284
Energy exchange at the surface of the western North Atlantic Ocean
[AD-A007296] N75-24285
Spectral analysis of the energy exchange at OWS NOVEMBER
[AD-A007484] N75-24286
OCEANOGRAPHY
A preliminary technology assessment of ocean thermal gradient energy generation
[PB-238646/4] N75-24147
Collected reprints: 1973. Atlantic oceanographic and meteorological laboratories
[COM-75-50164/3] N75-24283
The Intergovernmental Oceanographic Commission: An uncertain future
[COM-75-10233/5] N75-24287
OGO-5
Data user's notes of the radio astronomy experiment aboard the OGO-V spacecraft
[NASA-CR-143696] N75-24593
OIL ADDITIVES
The action of oil additives --- extreme pressure
N75-23994
OIL EXPLORATION
Preliminary analysis of the Beaver Creek and Ninemile Hill areas, Wind River Basin, Wyoming using image ratios and thematic classification
[E75-10287] N75-24060
OIL RECOVERY
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region. Attachment 3: Data set for Craney Island oil refinery installation experiment --- air pollution monitoring
[NASA-CR-142823] N75-24121
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 4: Data set for background investigation of atmospheric constituents for Nansemond River site --- a proposed oil refinery site
[NASA-CR-142821] N75-24122
OIL SLICKS
A method for the separation of oil from an aqueous oil, detergent solution prior to IR analysis, part 2
[AD-A006826] N75-24188
OILS
A method for determining oil in water
[AD-A007871] N75-23734
OMEGA-MESONS
Remarks about the decays phi into phi plus 2 pions and phi into omega plus 2 pions --- using direct couplings and epsilon intermediate states
[PM/75/5] N75-24458
ON-LINE PROGRAMMING
A fast-initializing digital equalizer with on-line tracking for data communications
N75-23843
On-line management information system feasibility in an R and D environment
[AD-A007723] N75-24528
ONE DIMENSIONAL FLOW
Nonstationary heat exchange in a free molecular range --- rarefied gas dynamics and one dimensional flow
N75-23870
OPERATING SYSTEMS [COMPUTERS]
Hardware-software interactions in SYMBOL-2R's operating system
[PB-239220/7] N75-24378
Atlantic Oceanographic and Meteorological Labs [AOML] computer users guide --- including a general system description
[COM-75-10200/4] N75-24407
OPERATIONAL PROBLEMS
Conference proceedings, Steam Power Plant Workshop
[PB-239514/3] N75-24148
OPERATORS [MATHEMATICS]
Determining the parameters of the prognostic operator for undamped fluctuations by the use of the D sub m[kappa; alpha 1,..., alpha sub m]
N75-24270
OPHTHALMOLOGY
The testing of peripheral vision
[NASA-TT-F-16312] N75-24322
OPTICAL ACTIVITY
Laser geodynamic satellite thermal/optical/vibrational analyses and testing. Volume 1: Executive summary --- retroreflector performance
[NASA-CR-120754] N75-23933
Laser geodynamic satellite thermal/optical/vibrational analyses and testing, volume 2, book 1 technical report --- retroreflector performance
[NASA-CR-120755] N75-23934
Laser geodynamic satellite thermal/optical/vibrational analysis and testing, volume 2, book 2 --- cubes and far fields
[NASA-CR-120756] N75-23935
OPTICAL COMMUNICATION
Integrated optical circuit devices
[AD-A007512] N75-24471
OPTICAL CORRECTION PROCEDURE
The automatic acquisition of interesting objects in a cluttered image environment --- pattern recognition and image enhancement in photographic processing
N75-23815
OPTICAL DATA PROCESSING
The space bandwidth produce of multi-channel coherent processes
[AD-A007775] N75-23955
OPTICAL DENSITY
Optical observations of a few small H2 regions detected at infrared wavelengths --- density and brightness distribution
N75-24557
OPTICAL FILTERS
Infrared gas filter correlation instrument for in-situ measurement of gaseous pollutants
[PB-239467/4] N75-23956
OPTICAL MEASURING INSTRUMENTS
Optical strain recording, analysis of strain histories in structures
[AD-A007829] N75-23948
An evaluation of the partial-reflection technique and results from the winter 1971-1972 D region
N75-24051

OPTICAL PROPERTIES
An example of the use of laboratory results in the optics of the sea
N75-24273

OPTICAL PUMPING
Infra-Red lasers and infra-red spectra of free radicals
[AD-A007720] N75-23978
A tunable dye laser diagnostic facility --- optical pumping and molecular energy levels
[AD-A007620] N75-23979

OPTICAL SCANNERS
Design study for a sensor utilizing an electrostatic camera. Volume 2: Appendices
[AD-A007070] N75-23940

OPTICAL TRANSFER FUNCTION
The effects of aberrations in synthetic aperture systems --- using optical transfer function, imaging techniques, and photographic equipment
[AD-A007774] N75-23954

OPTICS
Manual for the use of particle trajectories programs to first order of the optic series
[ISN-74-12] N75-24447
Laser window surface finishing and coating technology
[AD-A007791] N75-24466

OPTIMAL CONTROL
Optimum control of flight vehicle under the conditions of uncertainty
[AD-A007400] N75-23640
Approximate optimum control of the angle of roll in the problem of the reentry of hypersonic vehicles
[AD-A007456] N75-23641
Global optimality conditions and the Darboux point --- trajectory optimization
N75-24414
Optimal Synthesis Program for Automatic Control [OSPAC] --- in FORTRAN
[AD-A007550] N75-24416
Control of mixed distributed and lumped parameter systems --- linear systems governed by set of ordinary and partial differential equations
N75-24418

OPTIMIZATION
Control design considerations for variable geometry engines
N75-23583
Performance improvement of a field effect transistor with Schottky barrier on GaAs
[MB/DL-CRL-32/43] N75-24500
System analysis of a piston steam engine employing the uniflow principle, a study in optimized performance
[NASA-TM-X-66818] N75-24544

ORBIT CALCULATION
Contributions to the calculation of satellite transfer from near-earth to geostationary orbits by small thrust-acceleration in regularised variables
[ESRO-TT-138] N75-23638
Perturbation of a planetary orbiter by radiation pressure, account being taken of variation in the distance and direction of the sun
[ESRO-SR-24-ESOC] N75-23639

ORBITAL MECHANICS
Analysis of RAE-B attitude data
[NASA-CR-143793] N75-23632
Essentials of the theory of flight and elements of designing artificial earth satellites
[NASA-TT-F-16220] N75-23637

ORBITAL POSITION ESTIMATION
Some self starting integrators for x Prime equals f (x, t) --- Runge-Kutta method and orbital position estimation
[NASA-CR-141784] N75-24419

ORGANIC CHEMISTRY
Chemical evolution
[LBL-3319] N75-24369

ORGANIC COMPOUNDS
Bibliography on contaminants and solubility of organic compounds in oxygen
[NASA-TM-X-71700] N75-23688
Organic analysis by nuclear magnetic resonance
[NASA-TT-F-16276] N75-24446

ORGANIC MATERIALS
Specialists meeting on Failure Modes of Composite Materials with Organic Matrices and Their Consequences on Design
[AGARD-CP-163] N75-23698

ORGANIC PHOSPHORUS COMPOUNDS
Reactivating potency of some oximes towards phosphylated acetylcholinesterase
[TDCK-65518] N75-24310
An alternative therapy against organophosphate poisoning
[MBL-1974-32] N75-24337

ORGANIC SULFUR COMPOUNDS
Chemistry of organic sulfur compounds contained in petroleums and petroleum products, Volume 7
[TT-70-57759] N75-23691

ORGANIC WASTES [FUEL CONVERSION]
Production of gaseous fuel by pyrolysis of municipal solid waste
[NASA-CR-141791] N75-24105

ORION CONSTELLATION
The Orion nebula: A photographic study of spatial structure
N75-24556
An empirical model for the structure of the Orion nebula
N75-24574
The gas-to-dust ratio in the Orion nebula
N75-24581

OROGRAPHY
Effects of meso-scale and small scale interactions on global climate. Volume 1: Orographic effects on global climate
[AD-A007034] N75-24247

ORTHOGONALITY
Methods for computing and modifying the LDV factors of a matrix
[NPL-NAC-56] N75-24421

OSCILLATING FLOW
Unsteady behavior of transonic flows --- shock induced oscillation
[MPIS-MITT-59] N75-23516

OSO-1
Fabrication and evaluation of an OSO-1 type baseplate --- dimensional stability testing
[NASA-CR-143794] N75-23985

OSO-7
Solar gamma ray monitor for OSO-H [0.3-10 MeV]
[NASA-CR-143799] N75-23922
The investigation of O and N2 densities from the OSO-7 extreme UV data
[NASA-CR-142759] N75-24644

OVENS
Heat recovery systems for industrial furnaces, particularly coke ovens
[NASA-TT-F-16400] N75-23889

OXIDATION
The oxidation of ethylene in automotive engine exhaust gas; an experimental investigation
N75-23719
Effects of silicon additions on oxidation and mechanical behavior of the nickel-base superalloy B-1900
[NASA-TN-D-7989] N75-23761

OXIDATION RESISTANCE
Modified ferritic iron alloys with improved high-temperature mechanical properties and oxidation resistance
[NASA-TN-D-7966] N75-23760

OXYGEN
System evaluation of solid chemical oxygen generators --- using sodium chlorate candles
[AD-A007691] N75-23690
Variations in the work function of [100]W by the adsorption of oxygen, the adsorption of cesium and the coadsorption of oxygen and cesium
[NASA-TT-F-16364] N75-23725
Interstitial relaxations due to hydrostatic stress in niobium-oxygen alloys
N75-23743
Radiosensitization of biologically active DNA in cellular extracts by oxygen. Evidence that the presence of SH-compounds is not required
[MBL-1974-29] N75-24334
Vibrational intensity distributions for continuum photoionization of oxygen
[NASA-CR-142748] N75-24438
The investigation of O and N2 densities from the OSO-7 extreme UV data
[NASA-CR-142759] N75-24644

OXYGEN ATOMS
New laser oscillation in the oxygen atom
[AD-A007780] N75-23977
Study of the reaction of atomic oxygen with aerosols
[NASA-CR-2529] N75-24441

OZONE
Ozone in the planetary atmosphere from measurements on board the Mars-7 automatic interplanetary station
[NASA-TT-F-16338] N75-24618

P

PACIFIC OCEAN
Consolidation of U.S. oceanic air traffic control centers in pre-aerosat era
[AD-A009299] N75-23548
An experimental investigation of the boundary layer under pack ice
[AD-A007335] N75-24049
Spectral analysis of the energy exchange at OWS NOVEMBER
[AD-A007484] N75-24286

PAINTS
Water-base coatings
[AD-A007851] N75-24011

PAIR PRODUCTION
Leptons production in hadronic collisions, partons, vector mesons and new particles
[PM/75/3] N75-24456

PARACHUTES
Emergency ejection, sequence of operation
[AD-A007470] N75-23539

PARALLEL PLATES
Flow of rarefied gas between two parallel plates
[AD-A007303] N75-23898

PARALLEL PROCESSING [COMPUTERS]
Fault detection through parallel processing in Boolean algebra
[AD-A007552] N75-24397

PARTIAL DIFFERENTIAL EQUATIONS
Parameter identification in distributed systems using a digital simulation language: Using extension of PDEL
[PB-239431/0] N75-24404
Solution of simultaneous partial differential equations: An extension of PDEL
[PB-239432/8] N75-24405
Control of mixed distributed and lumped parameter systems --- linear systems governed by set of ordinary and partial differential equations
N75-24418
Nonlinear acoustics. Part 1: Physical phenomena, exact basic equations, and problems in formulation and solution of approximate equations
[AD-A002997] N75-24434

PARTICLE ACCELERATION
Solar gamma-ray lines as probes of accelerated particle directionalities in flares
[NASA-TM-X-70890] N75-24646
Report on the Brookhaven solar neutrino experiment
[BNL-19278] N75-24652

PARTICLE COLLISIONS
Leptons production in hadronic collisions, partons, vector mesons and new particles
[PM/75/3] N75-24456

PARTICLE DENSITY [CONCENTRATION]
On the structure of M17S --- behavior of 9.7 micron band due to dust particles
N75-24563
A cloud-chamber search for multiple-cores and high transverse-momenta in cosmic ray air showers --- particle density [concentration]
N75-24650

PARTICLE INTERACTIONS
Four particle exchange in solid He-3
[NASA-CR-142801] N75-24503
Multiparticle production in the interactions of charged cosmic ray hadrons with nuclear targets
N75-24651

PARTICLE PRODUCTION
Multiparticle production in the interactions of charged cosmic ray hadrons with nuclear targets
N75-24651

PARTICLE SIZE DISTRIBUTION
Droplet diameter and size distribution of JP-4 fuel injected into a subsonic airstream
[AD-A007687] N75-24192
Evolutionary characteristics of a bimodal grain model --- interstellar grains
N75-24576

PARTICLE TRAJECTORIES
Manual for the use of particle trajectories programs to first order of the optic series
[ISN-74-12] N75-24447

PARTONS
Leptons production in hadronic collisions, partons, vector mesons and new particles
[PM/75/3] N75-24456
A modified parton model for reactions with time-like photons --- comprised of a pair of valence quarks and other particles
[PM/75/4] N75-24457

PASSENGERS
Passenger demographics and subjective response to commuter aircraft in the northeast
[NASA-CR-142876] N75-23532

PASSIVE L-BAND RADIOMETERS
Passive Radar
[AD-A007651] N75-23828

PATHOGENESIS
Role of metabolic shifts in the pathogenesis of vestibular disturbances
[NASA-TT-F-16431] N75-24327

PATTERN RECOGNITION
The automatic acquisition of interesting objects in a cluttered image environment --- pattern recognition and image enhancement in photographic processing
N75-23815
Man-machine communications: An examination of the machines
N75-24371

PAVEMENTS
Design of high speed moving pavements for mass transit
[TT-7410] N75-24545

PAYLOADS
Manned systems utilization anaylsis. Study 2.1: Space servicing pilot program study --- for automated payloads
[NASA-CR-142758] N75-23620
Astrionic system optimization and modular astrionics for NASA missions after 1974. Preliminary

definition of astrionic system for space tug Mission Vehicle Payload [MVP]
[NASA-CR-120618] N75-23627
PENETRATION
Effect of surface metallurgy on the penetration depth and RF breakdown field of superconducting niobium
[BNL-19276] N75-24512
PENNING DISCHARGE
Determination of electron temperature in a penning discharge by the helium line ratio method
[NASA-TM-X-71677] N75-24478
PERFORMANCE
Numerical control of a turbomachine N75-23590
Simulation techniques for turbomachines N75-23591
PERFORMANCE PREDICTION
Total powerplant simulation N75-23594
The effect of sunshine testing on terrestrial solar cell system components
[NASA-TM-X-71722] N75-24109
PERFORMANCE TESTS
Development and evaluation of automobile crash sensors
[PB-237940/2] N75-23939
The evaluation of NiCd cell covers. Part 1: Text and tables --- on circular and rectangular covers
[NLR-TR-74116-C-PT-1] N75-24016
The evaluation of NiCd cell covers. Part 2: Figures --- on circular and rectangular covers
[NLR-TR-74116-C-PT-2] N75-24017
Predictive validities of several clinical color vision tests for aviation signal light gun performance
[AD-A606792] N75-24317
PERIPHERAL VISION
The testing of peripheral vision
[NASA-TT-F-16312] N75-24322
PERITONEUM
Respiratory and intraperitoneal infection of mice with encephalomyocarditis virus: Effect of sublethal X-irradiation on host resistance and survival
[MBL-1975-2] N75-24331
PERTURBATION THEORY
An accelerated elimination technique for the solution of perturbed Hamiltonian systems --- von Zeipel method N75-24417
PERU
Physical nature of the climatic and biological effects of the Peru current N75-24279
PESTICIDES
A conceptual model for the movement of pesticides through the environment: A contribution of the EPA alternative chemicals program
[PB-238653/0] N75-24200
PHASE DIAGRAMS
Thermodynamic properties and phase diagram of ternary sodium alloys. 1: The system sodium plus cadmium plus indium
[PEL-230] N75-23730
PHASE MODULATION
Principles for the construction of polarization converters and modulators, chapter 3 --- including phase shifters and modulation N75-23824
PHASE SHIFT
Tables of scattering amplitudes, spin polarizations and phase shifts of 25 eV to 1500 eV electrons scattered elastically from Li, Na, Mg, P, K, Ca, Sc, Mn, Ga, Br, Sr, Mo, Rh, Cd, Ba, W, and Os, 3
[AD-A007055] N75-23739
Principles for the construction of polarization converters and modulators, chapter 3 --- including phase shifters and modulation N75-23824
PHASE SHIFT CIRCUITS
A broadband digital diode phase shifter using a matrix interconnection of quadrature hybrid couplers, phase 1
[AD-A007294] N75-23864
Controllable liquid artificial dielectric S-band phase shifters
[AD-A007785] N75-23868
PHASE TRANSFORMATIONS
Role of deformation induced phase transformations in the plasticity of some iron-base alloys
[LBL-2775] N75-23768
SbSI physical properties near the ferroelectric phase change point N75-24501
PHASED ARRAYS
A simplified technique for phase control of conformal arrays
[AD-A007486] N75-23835
PHASED LOCKED SYSTEMS
A technique for determining the accuracy of an incremental shaft encoder --- phased locked systems
[AD-A007781] N75-23945
PHONETICS
Complex waveform phonetic speech synthesis N75-23814
PHOSPHORUS
Parameters of the pulsed phosphorus laser system
[AD-A007694] N75-23982
PHOTOCHEMICAL REACTIONS
Photochemical conversion of solar energy
[PB-238533/4] N75-24132
Mathematical simulation of smog chamber photochemical experiments
[PB-238094/7] N75-24180
Comprehensive technical report on all atmospheric contaminants associated with photochemical air pollution
[PB-239510/1] N75-24197
PHOTODIODES
Solid state camera
[MB/MC-GD-2036/73] N75-23917
PHOTOGRAPHIC EQUIPMENT
The effects of aberrations in synthetic aperture systems --- using optical transfer function, imaging techniques, and photographic equipment
[AD-A007774] N75-23954
Instrumentation and some results of photographic study on board the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16342] N75-24623
PHOTOGRAPHIC PLATES
The Orion nebula: A photographic study of spatial structure N75-24556
PHOTOGRAPHIC PROCESSING
The automatic acquisition of interesting objects in a cluttered image environment --- pattern recognition and image enhancement in photographic processing N75-23815
PHOTOGRAPHIC RECORDING
Optical strain recording, analysis of strain histories in structures
[AD-A007829] N75-23948
PHOTOINTERPRETATION
Identification and interpretation of tectonic features from Skylab imagery --- Mojave Desert and San Bernardino Mountains, California
[E75-10288] N75-24061
PHOTOIONIZATION
Vibrational intensity distributions for continuum photoionization of oxygen
[NASA-CR-142748] N75-24438
PHOTOMAPPING
Investigation of the analytical stereoplotter AP/C [OP/C phase] in application to highway engineering projects
[PB-238461/8] N75-24091
PHOTON BEAMS
Deformation of the atmosphere by intense laser beams at 10.6 microns --- atmospheric effects
[DREV-TN-2099/74] N75-23965
PHOTONS
A modified parton model for reactions with time-like photons --- comprised of a pair of valence quarks and other particles
[PM/75/4] N75-24457
PHOTOVOLTAIC CELLS
Photovoltaic solar power systems N75-24098
Space satellite power system --- conversion of solar energy by photovoltaic solar cell arrays
[NASA-CR-142799] N75-24099
The high intensity solar cell: Key to low cost photovoltaic power
[NASA-TM-X-71718] N75-24108
Advances in the theory and application of BSF cells --- including electrical resistivity and photovoltaic cells
[NASA-TM-X-71723] N75-24112
Photochemical conversion of solar energy
[PB-238533/4] N75-24132
Terrestrial photovoltaic power systems with sunlight concentration
[PB-238506/0] N75-24136
PHYSICAL EXAMINATIONS
Medical requirements and examination procedures in relation to the tasks of today's aircrew: Comparison of examination techniques in neurology, psychiatry and psychology with special emphasis on objective methods and assessment criteria
[AGARD-CP-153] N75-24297
PHYSICAL FACTORS
A multi-disciplinary team for the treatment of patients with defect upper extremities: A need for optimal rehabilitation
[WTHD-67] N75-24325
PHYSICAL PROPERTIES
The preparation and physical properties of polyester-poly [methyl methacrylates] triblock copolymers
[AD-A007347] N75-23689
Physics of the sea and atmosphere
[NASA-TT-F-16225] N75-24262
SbSI physical properties near the ferroelectric phase change point N75-24501
PHYSIOLOGICAL RESPONSES
Changes in visual evoked response by non-visual task processing --- computer programs N75-24301
Pulse wave velocity over the vascular wall as a means for distinguishing between different psychophysiological reaction patterns to a mental task N75-24302
Catecholamine excretion from air cadets --- adrenal gland response N75-24303
Flight fitness and psycho-physiological behavior of applicant pilots in the first flight missions N75-24304
Spinal effects of an electrical vestibular stimulation in man
[NASA-TT-F-16314] N75-24318
The influence of ionizing radiation on the immune response
[MBL-1974-28] N75-24329
Electrophysiological effects of electromagnetic fields on animals --- radiation effects of microwaves on nervous system
[AD-A007520] N75-24347
Prediction of physiological respones to work, environment and clothing
[AD-A007282] N75-24348
PIEZOELECTRIC CRYSTALS
Piezoelectric aluminum nitride films
[AD-A007657] N75-24518
PIEZOELECTRICITY
An investigation of the energy-momentum relations for the piezoelectric polaron N75-24437
Electron photon interactions in semiconductors N75-24465
The effect of anisotropy on the piezoelectric polaron --- Hamiltonian functions N75-24489
PILOT PERFORMANCE
Flight fitness and psycho-physiological behavior of applicant pilots in the first flight missions N75-24304
Laboratory assessment of pilot performance using nonrated subjects at three alcohol dose levels
[AD-A007727] N75-24349
Aviator visual performance in the UH-1 study 2
[AD-A007812] N75-24357
Manual control in target tracking tasks as a function of controller characteristics: A flight stimulator investigation, phase 2
[AD-A007384] N75-24368
PILOT PLANTS
Demonstration plant, clean boiler fuels from coal. Volume 3: Preliminary design/economics analysis
[PB-238529/2] N75-24127
PILOT SELECTION
Impact of multivariate analysis on the aviation selection and classification process N75-24306
Sixteen years experience in military aviation psychiatry and neurology --- pilot selection N75-24309
PILOT TRAINING
Administration of the Rorschach tests to a sample of student pilots training apprenticeship N75-24299
Catecholamine excretion from air cadets --- adrenal gland response N75-24303
Impact of multivariate analysis on the aviation selection and classification process N75-24306
Visual and auditory information processing aspects of the acquisition of flying skill
[AD-A007721] N75-24358
PIONEER 10 SPACE PROBE
Preliminary model studies of the magnetosphere of Jupiter: Pioneer 10
[NASA-CR-142813] N75-24626
Mission to Jupiter --- Pioneer 10 and 11 space probes
[NASA-TM-X-66830] N75-24634
Encounter with Jupiter --- Pioneer 10 space probe
[NASA-TM-X-66831] N75-24635
A new look at Jupiter: Results at the now frontier --- Pioneer 10, interplanetary space, and Jupiter atmosphere
[NASA-TM-X-66832] N75-24636
A review of the Jovian magnetosphere based upon Pioneer 10 and 11
[NASA-TM-X-70900] N75-24643
PIONEER 11 SPACE PROBE
Mission to Jupiter --- Pioneer 10 and 11 space probes
[NASA-TM-X-66830] N75-24634
Pioneer 11 encounter --- with Jupiter
[NASA-TM-X-66833] N75-24637
Summary of initial results from the GSFC fluxgate magnetometer on Pioneer 11
[NASA-TM-X-70899] N75-24642
A review of the Jovian magnetosphere based upon Pioneer 10 and 11
[NASA-TM-X-70900] N75-24643
PIONS
Remarks about the decays phi into phi plus 2 pions and phi into omega plus 2 pions --- using direct couplings and epsilon intermediate states
[PM/75/5] N75-24458

PISTON ENGINES
System analysis of a piston steam engine employing the uniflow principle, a study in optimized performance
[NASA-TM-X-66818] N75-24544
PITCH [INCLINATION]
Aerodynamic characteristics of an axisymmetric body undergoing a uniform pitching motion
[AD-A007553] N75-23523
Unsteady momentum integral analysis of the laminar boundary layer on an elliptic cylinder oscillating in pitch
N75-23878
PLANE WAVES
Radiation pattern, reactive power, and resistive aperture antennas --- plane waves
[AD-A007675] N75-23840
Application of complex ray tracing to the scattering of an evanescent plane wave by a conducting circular cylinder
N75-24429
Focusing problems in wave propagation: A method based on almost plane waves
N75-24461
PLANETARY ATMOSPHERES
Studies on possible propagation of microbial contamination in planetary atmospheres
[NASA-CR-142825] N75-24296
PLANETARY EVOLUTION
Jupiter and planet Earth --- planetary and biological evolution and natural satellites
[NASA-TM-X-66829] N75-24633
PLANETARY GRAVITATION
Gravity fields of the solar system
[NASA-SP-8117] N75-24608
PLANETARY MAGNETIC FIELDS
Magnetic field of the planet Mars based on Mars-3 and Mars-5 satellite data
[NASA-TT-F-16350] N75-24614
PLANETARY MASS
Jupiter: Giant of the solar system --- its solar orbits
[NASA-TM-X-66827] N75-24631
Jupiter: As a planet --- its physical characteristics and radio waves emitted from Jupiter
[NASA-TM-X-66828] N75-24632
PLANETARY NEBULAE
Calculation of infrared spectra from dust in planetary nebulae
N75-24580
The rocket ultraviolet spectrum of the planetary nebula NGC 7027
[NASA-TM-X-70892] N75-24594
PLANETARY QUARANTINE
Planetary quarantine: Supporting research and technology
[NASA-CR-142878] N75-24362
PLASMA CONTROL
The flux of particle loss in a permeable plasma
[TRITA-EPP-74-20] N75-24483
On tornado traps operated as rotating plasma devices
[TRITA-EPP-74-22] N75-24485
Plasma equilibrium in external ring systems
[TRITA-EPP-74-23] N75-24486
PLASMA HEATING
The balance of rotating plasma slabs
[TRITA-EPP-74-19] N75-24482
On tornado traps operated as rotating plasma devices
[TRITA-EPP-74-22] N75-24485
PLASMA INTERACTIONS
Generation of monochromatic electrostatic waves of large amplitudes in a bounded beam-plasma system
[LRP-88/74] N75-24481
PLASMA LAYERS
HEOS 2 plasma observations in the distant polar magnetosphere: The plasma mantle
[MPI-PAE/EXTRATERR-108] N75-24207
PLASMA OSCILLATIONS
Electron plasma oscillations in a static electric field
[TRITA-EPP-74-21] N75-24484
PLASMA PHYSICS
Initial operation of Siemens superconducting prototype magnet W VII at the Plasma Physics Institute
[NASA-TT-F-16291] N75-24479
Report of NRL progress --- including fracture mechanics, plasma physics, underwater acoustics, and radio communication
[PB-238901/3] N75-24663
PLASMA PROBES
Laboratory and flight results of the microstrip plasma probe --- blackout [propagation] and plasma sheaths
[AD-A007685] N75-23947
PLASMA RADIATION
Absolute intensity of radiation emitted by uranium plasmas
[NASA-TM-X-71942] N75-24477
PLASMA SHEATHS
Laboratory and flight results of the microstrip plasma probe --- blackout [propagation] and plasma sheaths
[AD-A007685] N75-23947
PLASMA WAVES
Drift wave instabilities in plasmas with shear flow
[MPI-PAE/EXTRATERR-106] N75-24476
PLASMA-ELECTROMAGNETIC INTERACTION
Plasma equilibrium in external ring systems
[TRITA-EPP-74-23] N75-24486
PLASMAS [PHYSICS]
Linear conversion and parametric instabilities in a nonuniform plasma
[AD-A007259] N75-24487
Non-linear stabilization of beam plasma interactions by parametric effects
[AD-A007487] N75-24488
PLASTIC COATINGS
Water-base coatings
[AD-A007851] N75-24011
PLASTIC DEFORMATION
Calculation of loads and deformations of sweptback wing with the aid of mechanical analog instruments
[AD-A007308] N75-23525
Plasticity theory of fiber-reinforced metal matrix composites
N75-23694
Ultrasonic pressure working of metals, chapters 2 and 5
[AD-A007695] N75-23783
PLASTIC PROPERTIES
Role of deformation induced phase transformations in the plasticity of some iron-base alloys
[LBL-2775] N75-23768
PLASTICS
Probabilistic approach to plasticity in polycrystalline materials using dislocation mechanics
[LBL-3384] N75-23789
Smoke hazards from burning plastics
[UCRL-76015] N75-23809
PLATES [STRUCTURAL MEMBERS]
The criterion for optimum character for the selection of the thicknesses of plates which are located under the action of bending load
[AD-A007455] N75-24046
PLATINUM
Field ion microscopic study of films of molybdenum, platinum and tantalum vapor deposited on tungsten
N75-23747
A high frequency platinum resistance thermometer system for measuring turbulent atmospheric temperature fluctuations
[AD-A007284] N75-23951
PLUMES
Velocity variations of an Equatorial plume throughout a Jovian year
[NASA-CR-142894] N75-24639
PNEUMATIC CONTROL
Control system requirements dictated by optimization of engine operation
N75-23579
POISSON EQUATION
Nonlinear Couette flow problem in collisional plasmas --- using Boltzmann distribution and Poisson equation
N75-24475
POLAR ORBITS
HEOS 2 plasma observations in the distant polar magnetosphere: The plasma mantle
[MPI-PAE/EXTRATERR-108] N75-24207
POLAR REGIONS
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Jul. - Sep. 1974
[REPT-74/7-9] N75-24214
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Oct. - Dec. 1974
[REPT-74/10-12] N75-24215
POLARIMETRY
Polarimetric experiment on board Mars-5
[NASA-TT-F-16348] N75-24619
POLARIZATION [CHARGE SEPARATION]
Polarization potentials and elementary excitations in strongly interacting quantum liquids
N75-23875
POLARIZATION [SPIN ALIGNMENT]
Tables of scattering amplitudes, spin polarizations and phase shifts of 25 eV to 1500 eV electrons scattered elastically from Li, Na, Mg, P, K, Ca, Sc, Mn, Ga, Br, Sr, Mo, Rh, Cd, Ba, W, and Os, 3
[AD-A007055] N75-23739
POLARIZATION [WAVES]
Principles for the construction of polarization converters and modulators, chapter 3 --- including phase shifters and modulation
N75-23824
POLARIZATION CHARACTERISTICS
Expected far infrared polarization of H2 regions and the nuclei of galaxies
N75-24579
POLARONS
An investigation of the energy-momentum relations for the piezoelectric polaron
N75-24437
The effect of anisotropy on the piezoelectric polaron --- Hamiltonian functions
N75-24489
POLLUTION CONTROL
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region --- air pollution control studies in Virginia
[NASA-CR-142820] N75-24120
Real-time characterization of particles emitted by coal-fired power generating plant --- air pollution control
N75-24160
Guidelines for air quality maintenance planning and analysis. Volume 2. Plan preparation
[PB-237581/4] N75-24169
Guidelines for air quality maintenance planning and analysis. Volume 3: Control strategies
[PB-237582/2] N75-24170
Guidelines for air quality maintenance planning and analysis. Volume 4: Land use and transportation considerations
[PB-237583/0] N75-24171
Guidelines for air quality maintenance planning and analysis. Volume 6. Overview of air quality maintenance area analysis
[PB-237584/8] N75-24172
Guidelines for air quality maintenance planning and analysis. Volume 7. Projecting county emissions
[PB-237611/9] N75-24173
Guidelines for air quality maintenance planning and analysis. Volume 8: Computer-assisted area source emission gridding procedure
[PB-237585/5] N75-24174
Guidelines for air quality maintenance planning and analysis. Volume 10: Reviewing new stationary sources
[PB-237535/0] N75-24175
Guidelines for air quality maintenance planning and analysis. Volume 12: Applying atmospheric simulation models to air quality maintenance areas
[PB-237750/5] N75-24177
Biography on the planning aspects of air pollution control, summary and evaluation
[PB-238927/8] N75-24182
Field testing: Application of combustion modifications to control pollutant emissions from industrial boilers, phase 1
[PB-238920/3] N75-24185
Engineering and cost study of air pollution control for the petrochemical industry. Volume 1: Carbon black manufacture by the furnace process
[PB-238324/8] N75-24189
Mathematical simulation of an adsorber for pollutant removal
[PB-239331/2] N75-24194
POLLUTION MONITORING
An indirect method for measuring surface based temperature inversions --- air pollution monitoring
[AD-A007872] N75-23950
Infrared gas filter correlation instrument for in-situ measurement of gaseous pollutants
[PB-239467/4] N75-23956
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region --- air pollution control studies in Virginia
[NASA-CR-142820] N75-24120
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 3: Data set for Craney Island oil refinery installation experiment --- air pollution monitoring
[NASA-CR-142823] N75-24121
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 4: Data set for background investigation of atmospheric constituents for Nansemond River site --- a proposed oil refinery site
[NASA-CR-142821] N75-24122
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 5: Data set for background investigation of atmospheric constituents for Richmond, Virginia area --- air pollution monitoring
[NASA-CR-142822] N75-24164
Guidelines for air quality maintenence planning and analysis: Volume 11: Air quality monitoring and data analysis
[PB-237626/7] N75-24176
Marine pollution monitoring [petroleum]: Proceedings of a Symposium and Workshop held at the National Bureau of Standards
[COM-75-50071/0] N75-24183
Comprehensive technical report on all atmospheric contaminants associated with photochemical air pollution
[PB-239510/1] N75-24197
Digital film and precipitation meter, and oil pollution metering device
N75-24657
POLYCRYSTALS
Probabilistic approach to plasticity in polycrystalline materials using dislocation mechanics
[LBL-3384] N75-23789
POLYESTER RESINS
The preparation and physical properties of polyester-poly [methyl methacrylates] triblock copolymers
[AD-A007347] N75-23689

POLYESTERS
Influence of a strong static electrical field on the absorption spectrum of mylar polyester
[AD-A007864] N75-23795
POLYETHYLENES
Characterization of nylon 66-poly[ethylene glycol] blend fibers
N75-23785
Spheroidization of normal and deuterated polyethylene --- laser applications
[SAND-74-0318] N75-23996
The friction and wear of self lubricating polythenes
N75-23998
POLYMER CHEMISTRY
A study of glow discharge polymerization as a means of modifying the surface of polymers
[PB-239289/2] N75-23797
POLYMERIZATION
A study of glow discharge polymerization as a means of modifying the surface of polymers
[PB-239289/2] N75-23797
POLYMERS
Molecular mechanics of polymers by dynamic infrared techniques
N75-23786
A survey of the development of thermo-viscoelastic stress analysis --- polymers
[AD-A007561] N75-24045
POLYMETHYL METHACRYLATE
The preparation and physical properties of polyester-poly [methyl methacrylates] triblock copolymers
[AD-A007347] N75-23689
POLYNOMIALS
Account of shearing strain during the calculation of the oscillations of low aspect-ratio wing by the method of polynomials
[AD-A007397] N75-23518
POLYURETHANE RESINS
Water-base coatings
[AD-A007851] N75-24011
POPULATION INVERSION
A computer code for time dependent recombination lasers --- to solve population inversion problems
[AD-A007292] N75-23975
POROUS WALLS
Study of a porous surface microphone sensor in an aerofoil --- air flow
[NASA-CR-137652] N75-23932
POSITIVE FEEDBACK
Punctuation of transcription in vitro of the tryptophan operon of Escherichia coli. A novel type of control of transcription
[MBL-1975-4] N75-24311
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 3: Evidence for positive control of transcription
[MBL-1975-6] N75-24313
POSTFLIGHT ANALYSIS
Post-test navigation data analysis techniques for the shuttle ALT
[NASA-CR-141789] N75-23629
LANDSAT-2 launch and flight activation. Launch through orbit 50 and orbit adjust operation --- telemetry data processing
[NASA-CR-143744] N75-23630
POTENTIAL FLOW
Steady incompressible potential flow around lifting bodies immersed in a fluid
[NASA-CR-142817] N75-23886
POTENTIOMETRIC ANALYSIS
Application of computer controlled monitoring and data reduction to potentiometry and voltammetry
N75-24380
POWER EFFICIENCY
Efficiency and weight of voltage multiplier type ultra lightweight dc-dc converters
[NASA-TM-X-71735] N75-23851
POWER PLANTS
Variations in heat exchanger design for ocean thermal difference power plants
[PB-238572/2] N75-24134
POWER SPECTRA
Radiation pattern, reactive power, and resistive aperture antennas --- plane waves
[AD-A007675] N75-23840
POWER SUPPLY CIRCUITS
Power processor for a 30cm ion thruster
[NASA-CR-134785] N75-23679
Spacecraft high-voltage power supply construction
[NASA-TN-D-7948] N75-23852
PRECIPITATION [CHEMISTRY]
Observations of phases and volume changes during precipitation of hydride in zirconium alloys
[AE-499] N75-23762
PRECIPITATION [METEOROLOGY]
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, May 1973
N75-24165
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, Jun. 1973
N75-24166
PRESSING [FORMING]
Ultrasonic pressure working of metals, chapters 2 and 5
[AD-A007695] N75-23783
PRESSURE DRAG
Reynolds number effects on fore- and aftbody pressure drag
N75-23497
PRESSURE EFFECTS
On the effect of a pressure wave on a spherical shell
N75-24036
PRESSURE GRADIENTS
Condensation heat transfer inside horizontal tubes with internal axial fins --- including pressure gradients
N75-23877
PRESSURE REDUCTION
An airframe manufacturer's requirements for future propulsion controls
N75-23578
PRESSURE REGULATORS
PRAC: A new aero gas turbine engine control concept
N75-23584
PRIMARY COSMIC RAYS
The charge ratio of ultra high energy cosmic ray muons
N75-24649
PROBABILITY DISTRIBUTION FUNCTIONS
Some fast analytical techniques for the EEG --- using probability distribution function and hybrid computers
N75-24305
PROBABILITY THEORY
A probabilistic analysis of structural reliability against fatigue and fracture
N75-24021
Evaluation of probability forecasts in meteorology
N75-24226
PRODUCTION ENGINEERING
Modern analytical measuring instruments
[NASA-TT-F-16394] N75-23929
Production engineering measure for high range Geiger Mueller tube --- using surface finishing
[AD-A007258] N75-23944
PRODUCTION PLANNING
Automation trends --- technology utilization of digital computers for production planning in chemical engineering
[UCRL-75320] N75-23728
PROGRAMMING LANGUAGES
Engineering of quality software systems [towards an analysis of the LISP programming language]
[AD-A007769] N75-24390
Engineering of quality software systems [measuring the complexity of computer software]
[AD-A007770] N75-24391
Automatic program verification 3: A methodology for verifying programs --- proving and checkout
[AD-A007563] N75-24398
Parameter identification in distributed systems using a digital simulation language: Using extension of PDEL
[PB-239431/0] N75-24404
PROJECT PLANNING
Biography on the planning aspects of air pollution control, summary and evaluation
[PB-238927/8] N75-24182
PROJECTILE CRATERING
Efficiency of steel fragments on thin duralumin targets
[ISL-12/74] N75-24009
PROPELLANT STORABILITY
Acquisition system environmental effects study --- for capillary-screen propellant retention devices
[NASA-CR-120768] N75-23684
Minutes of the 16th Explosives Safety Seminar, volume 1 --- including ammunition and propellant storability
[AD-A007557] N75-23801
Minutes of the 16th Explosives Safety Seminar, volume 2 --- including ammunition and propellant storability
[AD-A007566] N75-23802
PROPELLER DRIVE
Improvement of propeller static thrust estimation
[NASA-CR-132680] N75-23567
PROPELLER EFFICIENCY
Improvement of propeller static thrust estimation
[NASA-CR-132680] N75-23567
PROPULSION
Accounting of aerodynamic forces on airframe/propulsion systems --- for designing military aircraft
N75-23507
PROPULSION SYSTEM CONFIGURATIONS
Advanced engine mounted fuel pump technology
N75-23601
Attitude control propulsion components, volume 1
[NASA-CR-136741-VOL-1] N75-23676
Attitude control propulsion components, volume 2
[NASA-CR-136741-VOL-2] N75-23677
PROPULSIVE EFFICIENCY
The role of computers in future propulsion controls
N75-23582
PROPYLENE
Effect of electron irradiation in vacuum on FEP-A silicon solar cell covers
[NASA-TM-X-71713] N75-23668
PROSTHETIC DEVICES
On the acceptance, functional gain and mental load in arm prosthesis and orthosis control
[WTHD-66] N75-24355
Artificial heart controls support
[ORO-4485-2] N75-24365
PROTECTION
FAA lightning protection study: Lightning protection requirements for AIL type 55 K instrumen: landing system
[AD-A008931] N75-23530
PROTECTIVE COATINGS
Examination of the influence of coatings on thin superalloy sections. Volume 2: Detailed procedures and data --- corrosion resistance
[NASA-CR-134792] N75-23756
Theory of the high temperature gas corrosion of metals beneath coatings
[TT-74-58010] N75-23781
Development of optical coatings for high-intensity laser applications
[AD-A007692] N75-24470
PROTON IRRADIATION
Irradiation effects on reactor structural materials
[HEDL-TME-74-51] N75-24038
Possible improvements to HF devices derived from irradiative control of the diffusion processes
[DTCE/3096] N75-24499
PROTOTYPES
Fabrication of experimental three-meter space telescope primary and secondary mirror support structure
[NASA-CR-143796] N75-23986
PSYCHIATRY
Medical requirements and examination procedures in relation to the tasks of today's aircrew: Comparison of examination techniques in neurology, psychiatry and psychology with special emphasis on objective methods and assessment criteria
[AGARD-CP-153] N75-24297
PSYCHOACOUSTICS
Psychophysical tests of potential design/certification criteria for advanced supersonic aircraft --- human noise tolerance
[AD-A009296] N75-24354
PSYCHOLOGICAL EFFECTS
Flight fitness and psycho-physiological behavior of applicant pilots in the first flight missions
N75-24304
PSYCHOLOGICAL FACTORS
Test for quick and early detection of psychic syndromes more frequent in the Air Force personnel
N75-24298
PSYCHOLOGICAL TESTS
Test for quick and early detection of psychic syndromes more frequent in the Air Force personnel
N75-24298
Standardization of objective medico-psychiatric questionnaire in the French Army
N75-24307
Psychic health: A quantite negligeable in flying fitness examinations
N75-24308
PSYCHOMOTOR PERFORMANCE
Computer measurement of complex performance --- on digital computers
N75-24300
PUBLIC HEALTH
Urban environmental health applications of remote sensing
[NASA-CR-141796] N75-24522
PULSE COMMUNICATION
Radiation of electromagnetic walsh, waves, part 2 -- - pulse communication
[AD-A007067] N75-23825
Digital transmission evaluation project. RDS-80 test
[AD-A007111] N75-23839
Brooknet: A high speed computer network --- data transmission
[BNL-19365] N75-24409
PULSE DOPPLER RADAR
Pulse Doppler ambiguity resolution --- basic programming language
[AD-A007416] N75-24415
PULSE GENERATORS
Time development of ultrashort pulse generation from a Nd:glass laser with a saturable dye and short laser pulse damage of GaAs and ZnTe at 1.06 microns
N75-23964
PULSE HEATING
Kapitza resistance and the reflection coefficient of heat pulses
N75-24462
PULSE RATE
Pulse wave velocity over the vascular wall as a means for distinguishing between different psychophysiological reaction patterns to a mental task
N75-24302

PULSED LASERS
Selected contributions to high-speed physics --- covering mechanical-electrical energy conversion in ferroelectric ceramics, and mode locked pulsed lasers
[BMVG-FBWT-74-8] N75-23804
Output energy optimization of a dye laser --- for intense flashlamp excitation, noting detrimental ultrasonic wave effect
N75-23807
Study and application of pulsed CO2 lasers --- noting excitation by electric discharges and electron beam
N75-23808
Electron laser-pulse scattering
N75-23961
Time development of ultrashort pulse generation from a Nd:glass laser with a saturable dye and short laser pulse damage of GaAs and ZnTe at 1.06 microns
N75-23964
Deformation of the atmosphere by intense laser beams at 10.6 microns --- atmospheric effects
[DREV-TN-2099/74] N75-23965
Calculation of rotational nonequilibrium in a pulsed HF laser
[UCRL-75814] N75-23969
Modelocked, multiline pulsed CO2 oscillator
[LA-5839-MS] N75-23971
Molecular lasers in E-beam stabilized discharges
[AD-A007577] N75-23980
Experimental pulsed laser, remote crosswind measurement system, feasibilty study and design, part 2
[AD-A007350] N75-23981
Parameters of the pulsed phosphorus laser system
[AD-A007694] N75-23982
PURIFICATION
A changed ATP-dependent DNAase: The characterization of the enzyme from Escherichia coli rorA
[MBL-1974-38] N75-24314
PYROELECTRICITY
Pyroelectric film/liquid crystal detector for 10.6 micrometers region --- using vinylidene
[AD-A007852] N75-23949
PYROLYSIS
Production of gaseous fuel by pyrolysis of municipal solid waste
[NASA-CR-141791] N75-24105

Q

QUADRUPOLES
The application of quadrupole mass spectrometry to nitrogen isotope analysis
N75-23720
QUALITY CONTROL
Shape and dimensional control of tridimentional objects --- Moire effects and imaging techniques
N75-24464
QUARKS
A modified parton model for reactions with timelike photons --- comprised of a pair of valence quarks and other particles
[PM/75/4] N75-24457
QUEUEING THEORY
Load sharing in computer networks: A queueing model
N75-24424

R

RABBITS
Quantitation of microwave radiation effects on the eyes of rabbits at 2450 MHz and 918 MHz
[AD-A007521] N75-24344
RADAR
Passive Radar --- technology transfer
[AD-A007438] N75-23830
Bistatic radar sea state monitoring field test
[NASA-CR-141394] N75-23919
RADAR BEACONS
Radar station evaluation report, Pease AFB, New Hampshire
[AD-A007041] N75-23553
RADAR ECHOES
Relationships between motion on isentropic surfaces from 3-H rawinsonde data and radar echoes
[NASA-CR-2558] N75-24232
RADAR IMAGERY
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-1] N75-24064
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-2] N75-24065
RADAR PHOTOGRAPHY
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-1] N75-24064
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-2] N75-24065
RADAR RECEIVERS
The Anchorage, Alaska, real time auroral radar monitor: System description and some preliminary analyses
[COM-75-50114/8] N75-24241
RADAR SIGNATURES
On the statistical analysis of the radar signature of the MQM-34D
[AD-A007765] N75-23552
RADAR TRACKING
Passive Radar
[AD-A007651] N75-23828
Manual control in target tracking tasks as a function of controller characteristics: A flight stimulator investigation, phase 2
[AD-A007384] N75-24368
RADIANCE
Difference equation for superradiance
[NASA-CR-142875] N75-24439
RADIANT FLUX DENSITY
Absolute intensity of radiation emitted by uranium plasmas
[NASA-TM-X-71942] N75-24477
RADIATION
Perturbation of a planetary orbiter by radiation pressure, account being taken of variation in the distance and direction of the sun
[ESRO-SR-24-ESOC] N75-23639
RADIATION ABSORPTION
Some new methods of determining and studying the absorptivity of a medium and the generalized angular coefficients of radiation
N75-24274
RADIATION DAMAGE
The influence of ionizing radiation on the immune response
[MBL-1974-28] N75-24329
Radiosensitization of biologically active DNA in cellular extracts by oxygen. Evidence that the presence of SH-compounds is not required
[MBL-1974-29] N75-24334
Purification and characterization of an endonuclease from calf thymus acting on irradiated DNA
[MBL-1974-35] N75-24340
RADIATION DETECTORS
Wide angle sun sensor --- consisting of cylinder, insulation and pair of detectors
[NASA-CASE-NPO-13327-1] N75-23910
Earth radiation budget measurement from a spinning satellite: Conceptual design of detectors
[NASA-CR-132494] N75-23920
Solar gamma ray monitor for OSO-H [0.3-10 MeV]
[NASA-CR-143799] N75-23922
RADIATION EFFECTS
Metallurgy Department
[RISO-304] N75-23771
Absorption and luminescence of glasses during electron irradiation
[BNL-19348] N75-23790
Radiation induced electrical current and voltage in dielectric structures
[AD-A007670] N75-23867
Irradiation effects on reactor structural materials
[HEDL-TME-74-51] N75-24038
Quantitation of microwave radiation effects on the eyes of rabbits at 2450 MHz and 918 MHz
[AD-A007521] N75-24344
Measurement of absorbed power patterns in the head and eyes of rabbits exposed with typical microwave sources
[AD-A007524] N75-24346
Electrophysiological effects of electromagnetic fields on animals --- radiation effects of microwaves on nervous system
[AD-A007520] N75-24347
Studies of the effects of radiations
[COO-125-57] N75-24449
RADIATION HARDENING
Total-dose radiation-hardened COS/MOS integrated circuits
[AD-A007618] N75-23861
RADIATION HAZARDS
Biologic effects and health hazards of microwave radiation
[PB-239554/9] N75-24352
RADIATION PRESSURE
Perturbation of a planetary orbiter by radiation pressure, account being taken of variation in the distance and direction of the sun
[ESRO-SR-24-ESOC] N75-23639
RADIATION SOURCES
Compact infrared sources associated with southern H2 regions
N75-24560
Carbon monoxide mapping of 100 micrometer sources associated with dark clouds: Preliminary results
N75-24582
The dominant 10 to 20 micrometer source in the galactic centre
N75-24585
RADIATION TOLERANCE
Properties of uvrE mutants of Escherichia coli K12. Part 2: Construction and properties of pol and rec derivatives
[MBL-1974-26] N75-24333
RADIATIVE HEAT TRANSFER
Radiative heat transfer from products of combustion in building corridor fires
[COM-75-10209] N75-23742
Radiative transfer between surfaces with spectral, directional, and temperature dependent properties --- radiative heat transfer of tungsten by collimated solar flux
N75-23873
Meso-scale and small-scale interactions on global climate. Volume 2: Radiation transport effects on global climate
[AD-A007035] N75-24248
Temperature fields of an absorptive medium in a radiating system of arbitrary configuration [the spatial problem]
N75-24271
Calculation of the radiative heat exchange in a conical cavity of complex configuration with an absorptive medium
N75-24272
Some new methods of determining and studying the absorptivity of a medium and the generalized angular coefficients of radiation
N75-24274
Radiative transfer in spherical circumstellar dust envelopes
N75-24603
RADIATIVE TRANSFER
Ionisation structure and transfer of radiation in dusty nebulae
N75-24578
RADIO ASTRONOMY
H2 regions and the galactic centre
[ESRO-SP-105] N75-24555
Optical, infrared and radio observations of two H2 regions
N75-24559
One millimeter observations of H2 regions --- to establish mean spectral index in submillimeter region
N75-24568
New observations of H2 regions at 7.875, 15.5, 31.4, or 85 GHz
N75-24569
Radio recombination lines from carbon and heavier elements from the direction of NGC 2024
N75-24572
Recent radio observations of the galactic centre
N75-24588
Observations of neutral hydrogen in the region 355 deg greater than l sup II greater than 10 deg and -5 deg greater than b sup II greater than 5 deg --- galactic radio astronomy
N75-24589
Data user's notes of the radio astronomy experiment aboard the OGO-V spacecraft
[NASA-CR-143696] N75-24593
RADIO COMMUNICATION
Health care and satellite radio communication in village Alaska
[PB-238742/1] N75-24343
Report of NRL progress --- including fracture mechanics, plasma physics, underwater acoustics, and radio communication
[PB-238901/3] N75-24663
Report of NRL progress --- including metal fatigue, radio communication, and ionospherics
[PB-238839/5] N75-24664
RADIO ECHOES
A 1964 digital data base for ionospheric modeling. Part B: Incoherent scatter radar results
[COM-75-10199/8] N75-23827
RADIO FREQUENCIES
Effect of surface metallurgy on the penetration depth and RF breakdown field of superconducting niobium
[BNL-19276] N75-24512
RADIO FREQUENCY HEATING
Application of the radio frequency furnace technique to environmental trace analysis, part 1. The applicability of Hadamard Transform techniques to visible spectroscopy
N75-23722
RADIO OCCULTATION
Results of investigating the Martian atmosphere by radio-occultation using the Mars-2, Mars-4, and Mars-6 craft
[NASA-TT-F-16341] N75-24624
Preliminary results of two-frequency radio-occultation of the Mars ionosphere by means of Mars planetary probes in 1974
[NASA-TT-F-16340] N75-24625
RADIO RELAY SYSTEMS
Converter of non-electrical into electrical quantities, chapter 2 --- digital transducers in radio relay systems
N75-23854

RADIO SOURCES [ASTRONOMY]
High-resolution radio observations of the sources near K3-50
N75-24570
A high-resolution study of the H2 region W 3[OH] -- - at 6, 21, and 50 cm wavelengths
N75-24571
OH and the earliest evolution of H2 regions
N75-24573
Recent radio observations of the galactic centre
N75-24588
Intense sub-arcsecond structure in the galactic center --- radio sources
N75-24590

RADIO TELEMETRY
Elements of address and adaptive radio telemetry systems, chapter 8
N75-23822

RADIO TELESCOPES
High-resolution radio observations of the sources near K3-50
N75-24570
A high-resolution study of the H2 region W 3[OH] -- - at 6, 21, and 50 cm wavelengths
N75-24571
Observations of neutral hydrogen in the region 355 deg greater than l sup II greater than 10 deg and -5 deg greater than b sup II greater than 5 deg --- galactic radio astronomy
N75-24589

RADIO WAVES
Passive Radar
[AD-A007651] N75-23828

RADIOACTIVE ISOTOPES
Annual conference on Bioassay [20th], Environmental, and Analytical Chemistry
[PB-238772/8] N75-23693
Radioisotopes and global transport in the atmosphere
[TT-74-50025] N75-24190

RADIOACTIVE MATERIALS
Strontium fluoride compatibility program --- nonradioactive materials
[BNWL-1845-1] N75-23729
Project Rio Blanco: Project scientist's summary report of production test data and preliminary analysis of top chimney/cavity --- gas and radioactive analysis
[UCRL-76280] N75-24452

RADIOBIOLOGY
Studies on instrumentation, radiation and chemical physics, nuclear medicine, and artificial heart program. Part 4: Physical and analytical sciences
[BNWL-1850-PT-4] N75-24328

RADIOCHEMICAL SEPARATION
Feasibility studies on the radiochemical lithium solar neutrino experiment
[BNL-19300] N75-24442

RADIOCHEMISTRY
Annual conference on Bioassay [20th], Environmental, and Analytical Chemistry
[PB-238772/8] N75-23693

RADIOLOGY
Studies on instrumentation, radiation and chemical physics, nuclear medicine, and artificial heart program. Part 4: Physical and analytical sciences
[BNWL-1850-PT-4] N75-24328

RADIOMETERS
Radiometric performance of the Viking Mars lander cameras
[NASA-TM-X-72692] N75-23921
Experimental evaluation of atmospheric effects on radiometric measurements using the EREP of Skylab -- Salt Lake Desert
[E75-10283] N75-24056

RAIN
A stochastic rainfall model and statistical analysis of hydrologic factors
[PB-238948/4] N75-24238

RAIN GAGES
Some characteristics of Hawaiian high intensity rainfall
[PB-239398/1] N75-24261

RAINDROPS
Some characteristics of Hawaiian high intensity rainfall
[PB-239398/1] N75-24261

RAMAN SPECTROSCOPY
Characterization of implanted silicon by Raman and infrared spectrocopy
N75-24013

RAMPS [STRUCTURES]
Slope stability analysis: A computerized solution of Bishop's simplified method of slices
[PB-238954/2] N75-24548

RANDOM VIBRATION
Investigation of effects of vibration on a structure -- - working in real time
[NASA-TT-F-16305] N75-23926

RANGEFINDING
Passive ranging with wavefront sampling
[AD-A007387] N75-23836

RAPID TRANSIT SYSTEMS
Design of high speed moving pavements for mass transit
[TT-7410] N75-24545

RARE EARTH COMPOUNDS
Computing programme for a two sublattice neel ferrimagnet, application to the rareearth compounds
[IFA-SR-9-1974] N75-23770
Excitations and magnetic properties of rare-earth Al2 compounds
[RISO-312] N75-23772

RARE EARTH ELEMENTS
High resolution spectra of rare earth crystals
[AD-A007262] N75-23732

RAREFIED GAS DYNAMICS
Nonstationary heat exchange in a free molecular range --- rarefied gas dynamics and one dimensional flow
N75-23870
Flow of rarefied gas between two parallel plates
[AD-A007303] N75-23898
Spherical cavity in a free molecular flow --- numerical analysis using the Monte Carlo method
[AD-A007290] N75-23899

RATES [PER TIME]
Measurement of several rate coefficients for the He-Ne laser plasma
N75-24472

RATS
The cause of death resulting from transfusion resistant shock. Part 1: Influence of brain damage
[MBL-1975-1] N75-24330
Preferential release of newly synthesized acetylcholine by cortex slices from rat brain
[MBL-1974-34] N75-24339

RAWINSONDES
Relationships between motion on isentropic surfaces from 3-H rawinsonde data and radar echoes
[NASA-CR-2558] N75-24232
Updraft properties deduced from Rawinsoundings
[COM-75-10193/1] N75-24240

RAY TRACING
Ray-tracing simulation of swept-frequency backscatter ionograms
[AD-A007686] N75-23832
A systematic study of aplanatic two-mirror telescopes with application to the large spare telescope
N75-23914
Application of complex ray tracing to the scattering of an evanescent plane wave by a conducting circular cylinder
N75-24429

REACTION KINETICS
Strontium fluoride compatibility program --- nonradioactive materials
[BNWL-1845-1] N75-23729
Reaction rates and energy distributions among reaction products for the H plus Cl2 and Cl plus H2 reactions
[AD-A007782] N75-23735
Reaction rate data. Number 48: Annual summary of progress in FY 1974 DNA reaction rate program
[AD-A006574] N75-24216

REACTION WHEELS
Grease lubricated spiral groove bearings for long-life systems --- communication satellite momentum wheel
N75-24003

REACTOR MATERIALS
Irradiation effects on reactor structural materials
[HEDL-TME-74-51] N75-24038
Temperature dependence of particulate erosion --- tungsten and zirconium carbides
[AD-A007841] N75-24459

REAL TIME OPERATION
Investigation of effects of vibration on a structure -- - working in real time
[NASA-TT-F-16305] N75-23926
The Anchorage, Alaska, real time auroral radar monitor: System description and some preliminary analyses
[COM-75-50114/8] N75-24241

RECOMBINATION REACTIONS
A computer code for time dependent recombination lasers --- to solve population inversion problems
[AD-A007292] N75-23975
Radio recombination lines from carbon and heavier elements from the direction of NGC 2024
N75-24572

RECTANGULAR PLATES
Fabrication and evaluation of an OSO-1 type baseplate --- dimensional stability testing
[NASA-CR-143794] N75-23985

REENTRY TRAJECTORIES
Approximate optimum control of the angle of roll in the problem of the reentry of hypersonic vehicles
[AD-A007456] N75-23641

REFERENCE SYSTEMS
Standard reference materials: The role of SRM's in measurement systems --- in nuclear engineering and chemistry
[COM-75-50070/2] N75-23941

REFLECTANCE
Variation of solar-selective properties of black chrome with plating time
[NASA-TM-X-71731] N75-23753
Kapitza resistance and the reflection coefficient of heat pulses
N75-24462

REFLECTING TELESCOPES
A systematic study of aplanatic two-mirror telescopes with application to the large spare telescope
N75-23914

REFLECTION
An evaluation of the partial-reflection technique and results from the winter 1971-1972 D region
N75-24051

REFRACTIVITY
Laser beam deflection utilizing index of refraction gradients in liquid mediums
N75-23962
Refractometric measurements in the Lacq area
N75-24206
Electron photon interactions in semiconductors
N75-24465

REFRACTOMETERS
Refractometric measurements in the Lacq area
N75-24206

REFRACTORY METAL ALLOYS
Analysis of thermal stresses and metal movement during welding
[NASA-CR-120757] N75-23754

REFRIGERATING MACHINERY
Condensation heat transfer inside horizontal tubes with internal axial fins --- including pressure gradients
N75-23877

REGENERATORS
Fluidized bed regenerators for Brayton cycles
[NASA-TM-X-71736] N75-23891

REGIONAL PLANNING
Evaluation of the application of ERTS-1 data to the regional land use planning process --- Northeast Wisconsin
[E75-10280] N75-24053
Evaluation of power facilities; A reviewer's handbook --- electric and nuclear power plants
[PB-239221/5] N75-24198
Regional environmental analysis and management: New techniques for current problems
[NASA-TM-X-66813] N75-24546

REGRESSION ANALYSIS
Estimation of mixing ratio profiles over maritime areas by linear regression methods
[AD-A007654] N75-24217

REGULATORS
Punctuation of transcription in vitro of the tryptophan operon of Escherichia coli. A novel type of control of transcription
[MBL-1975-4] N75-24311

REINFORCED PLASTICS
Influence of fabrication parameters on the rupture of glass fiber reinforced plastics
N75-23704
Stress and strength analysis of reinforced plastic with holes. Consequences on design
N75-23705

REINFORCEMENT [STRUCTURES]
Calculation of the reinforced thin-walled construction by the method of the final element
[AD-A007307] N75-23560

REINFORCING FIBERS
Plasticity theory of fiber-reinforced metal matrix composites
N75-23694
Study of fiber reinforcement of thermoplastic polymers
N75-23695
Preparation and properties of tungsten-wire reinforced NiCr 80-20
[NASA-TT-F-16275] N75-23696

RELAXATION
Interstitial relaxations due to hydrostatic stress in niobium-oxygen alloys
N75-23743

RELAXATION [MECHANICS]
Problems relating to wind tunnel simulation of relaxing flows
[AD-A007406] N75-23900

RELIABILITY ANALYSIS
Power transistor reliability investigation
[AD-A007587] N75-23862
Long term reliability investigations of the MSC-1330 microwave power transistor and the AMPAC 1214-30 internally matched device
[AD-A007354] N75-23866
Engineering of quality software systems [software reliability modeling and measurement techniques]
[AD-A007773] N75-24394

RELIABILITY ENGINEERING
Reliability specification for gas turbine control systems
N75-23581

REMOTE SENSORS
Experimental pulsed laser, remote crosswind measurement system, feasibilty study and design, part 2
[AD-A007350] N75-23981
Multispectral aerial reconnaissance of parasitic attacks in forests: Remote sensing --- in France
N75-24052
Applications of remote sensing to watershed management
[NASA-TM-X-70896] N75-24072

A man-machine procedure for extracting information from data collected by the Earth Resources Technology Satellite
[PB-238431/1] N75-24073
Towards a Canadian policy on remote sensing from space, a special report to the Canadian Advisory Committee on Remote Sensing
[PB-238846/0] N75-24075
The Canadian Advisory Committee on Remote Sensing, 1973 report
[PB-238848/6] N75-24076
Investigation of multispectral techniques for remotely identifying terrain features and natural materials
[PB-238675/3] N75-24078
Field studies and remote sensing along the Natal Coast, South Africa
[AD-A007285] N75-24084
Remote sensing applications to resource management problems in the sahel
[PB-239867/5] N75-24087
Second EROS/AID international course on remote sensing
[PB-239479/9] N75-24088
Defense Meteorological Satellite Program [DMSP]: User's guide
[AD-A007678] N75-24256
Satellite infrared soundings from NOAA spacecraft --- to measure temperature and humidity
[COM-75-10256/6] N75-24260
Analysis of ERTS-A satellite photos for NOAA-AOML study to detect ocean eddies [sic]
[COM-75-10192/3] N75-24282
Urban environmental health applications of remote sensing
[NASA-CR-141796] N75-24522
Urban environmental health applications of remote sensing, summary report
[NASA-CR-141788] N75-24543

REMOVAL
Third body formation and elimination on carbon fiber epoxy composite --- effects on friction and wear
N75-24004

RENDEZVOUS TRAJECTORIES
Minimum-time rescue trajectories between spacecraft in circular orbits
N75-23628

RENE 41
Design and fabrication of Rene 41 advanced structural panels --- their performance under axial compression, shear, and bending loads
[NASA-CR-132646] N75-24032

REPRODUCTION [BIOLOGY]
Studies on propagation of microbes in the airborne state
[NASA-CR-142757] N75-24294

RESCUE OPERATIONS
Analysis of distress air cases in relation to crash position and intended track: 1968 - 1973
[AD-A007429] N75-23540
Minimum-time rescue trajectories between spacecraft in circular orbits
N75-23628

RESEARCH
Ocean engineering
[AD-A007297] N75-23812

RESEARCH AND DEVELOPMENT
Report on the Federal research and development program, fiscal year 1976
[PB-239528/3] N75-24527
NSF-RANN energy abstracts. A monthly abstract journal of energy research
[ORNL-EIS-74-52-VOL-2-NO-6] N75-24532

RESEARCH MANAGEMENT
Electric power systems analysis research
[PB-239236/3] N75-24139

RESEARCH PROJECTS
Towards a Canadian policy on remote sensing from space, a special report to the Canadian Advisory Committee on Remote Sensing
[PB-238846/0] N75-24075
The Canadian Advisory Committee on Remote Sensing, 1973 report
[PB-238848/6] N75-24076
Studies on instrumentation, radiation and chemical physics, nuclear medicine, and artificial heart program. Part 4: Physical and analytical sciences
[BNWL-1850-PT-4] N75-24328
Abstract reports: Presented at the Meetings of the American Association for the Advancement of Science
[PB-239273/6] N75-24523
Abstract reports: Presented at the meetings of the American Association for the Advancement of Science, May - December 1972
[PB-239274/4] N75-24538

RESERVOIRS
The use of ERTS imagery in reservoir management and operation --- New England
[E75-10286] N75-24059

RESIDENTIAL AREAS
The development of a solar residential heating and cooling system
[NASA-CR-142728] N75-24107
The residential user and the electrical load factor
[PB-238535/9] N75-24152

RESIDUAL STRESS
Performance improvement of aluminum and titanium based alloys by new tempering methods for cooling acceleration and reduction of residual stresses
N75-24029
Residual stresses in notches produced by variable operational loads and their importance for the application of the linear cumulative damage hypothesis
[RAE-LIB-TRANS-1800] N75-24033

RESISTANCE THERMOMETERS
A high frequency platinum resistance thermometer system for measuring turbulent atmospheric temperature fluctuations
[AD-A007284] N75-23951

RESONANT FREQUENCIES
Natural oscillations of liquid in a horizontal container with symmetric double-connected cross section
[AD-A007312] N75-23906
Questions of the kinetics of stimulated gamma radiation --- resonant frequencies and the Mossbauer effect
N75-23967

RESOURCE ALLOCATION
Electric power rights: One approach to rationing
[PB-238537/5] N75-24138
An approach to the power shortage problem: Optimal allocation of existing excess reserves through interregional transmission
[PB-238578/9] N75-24151
Deadlock in distributed computer networks --- multiprogramming and resource allocation
[PB-238943/5] N75-24412

RESOURCES
The Intergovernmental Oceanographic Commission: An uncertain future
[COM-75-10233/5] N75-24287

RESOURCES MANAGEMENT
Use of interactive computer graphics in water resources planning and management
[PB-238631/6] N75-24079
Remote sensing applications to resource management problems in the sahel
[PB-239867/5] N75-24087
Energy system modeling-interfuel competition
[PB-239292/6] N75-24140
National energy flow accounts
[PB-239275/1] N75-24539

RESPIRATORY DISEASES
Respiratory and intraperitoneal infection of mice with encephalomyocarditis virus: Effect of sublethal X-irradiation on host resistance and survival
[MBL-1975-2] N75-24331

RESPIRATORY IMPEDANCE
An alternative therapy against organophosphate poisoning
[MBL-1974-32] N75-24337

RETAINING
Sacrificial cage materials for the in-situ lubrication of rolling bearings --- accelerated service-simulation testing
N75-23999

RETARDANTS
Smoke hazards from burning plastics
[UCRL-76015] N75-23809

RETROREFLECTION
Laser geodynamic satellite thermal/optical/vibrational analyses and testing. Volume 1: Executive summary --- retroreflector performance
[NASA-CR-120754] N75-23933
Laser geodynamic satellite thermal/optical/vibrational analyses and testing, volume 2, book 1 technical report --- retroreflector performance
[NASA-CR-120755] N75-23934

REYNOLDS NUMBER
Reynolds number effects on fore- and aftbody pressure drag
N75-23497
Reynolds number effects on boattail drag of exhaust nozzles from wind tunnel and flight tests
N75-23506

RIBONUCLEIC ACIDS
Punctuation of transcription in vitro of the tryptophan operon of Escherichia coli. A novel type of control of transcription
[MBL-1975-4] N75-24311

RING STRUCTURES
Research and development in the field of spacecraft mechanical devices --- collector rings and bearings
N75-24007
Inelastic response of ring-stiffened cylindrical shells to external pressure shock waves
[AD-A007329] N75-24041

RIVER BASINS
Preliminary analysis of the Beaver Creek and Ninemile Hill areas, Wind River Basin, Wyoming using image ratios and thematic classification
[E75-10287] N75-24060
Environmental aspects of run-off and siltation in the Anacostia basin from hyperaltitude photographs
[NASA-TM-X-70888] N75-24067

RIVERS
Broadband spectral photography of the James River
[NASA-TM-X-72689] N75-24068
Hydraulic and flow studies related to sediment transport, Kentucky River, Kentucky
[PB-239259/5] N75-24092
River forecasts provided by the National Weather Service. Volume 2: 1973
[COM-75-50005/8] N75-24243

ROCKET ENGINE DESIGN
Attitude control propulsion components, volume 1
[NASA-CR-136741-VOL-1] N75-21676
Attitude control propulsion components, volume 2
[NASA-CR-136741-VOL-2] N75-23677

ROCKET EXHAUST
Nonequilibrium radiation model for exhaust plumes
[AD-A007795] N75-23687

ROCKET LAUNCHING
The 03702 Honest John Missile No. 1005, round no. 645 AML
[AD-A007462] N75-24254

ROCKET-BORNE INSTRUMENTS
The rocket ultraviolet spectrum of the planetary nebula NGC 7027
[NASA-TM-X-70892] N75-24594

ROCKS
Investigation of multispectral techniques for remotely identifying terrain features and natural materials
[PB-238675/3] N75-24078

ROLLING MOMENTS
Velocity and rolling-moment measurements in the wake of a swept-wing model in the 40 by 80 foot wind tunnel
[NASA-TM-X-62414] N75-23481

RORSCHACH TESTS
Administration of the Rorschach tests to a sample of student pilots training apprenticeship
N75-24299

ROTARY WINGS
Prediction of rotor wake induced flow along the rocket trajectories of an Army AH-1G helicopter
[AD-A007878] N75-23528
Advanced overrunning clutch technology, design phase
[AD-A007815] N75-23562
Research on helicopter rotor noise
[AD-A007261] N75-23608
The development of experimental techniques for the study of helicopter rotor noise
[NASA-CR-137684] N75-23611

ROTATING BODIES
Range-Doppler imaging of rotating objects
N75-23542
Rotating, charged or gravitating liquid drop, and problems in nuclear physics and astronomy
[LBL-3363] N75-24451

ROTATING PLASMAS
The balance of rotating plasma slabs
[TRITA-EPP-74-19] N75-24482

ROTATING SPHERES
Magnetic torque on a rotating superconducting sphere
[NASA-TR-R-443] N75-24502

RUBBER
Concerning the nature of rubber glass: Transition of elastomeric materials
[AD-A007348] N75-23796

RUMANIA
Romanian computers and office equipment described
N75-24660

RUNGE-KUTTA METHOD
Some self starting integrators for x Prime equals f [x, t] --- Runge-Kutta method and orbital position estimation
[NASA-CR-141784] N75-24419

RUPTURING
Influence of fabrication parameters on the rupture of glass fiber reinforced plastics
N75-23704
Possible utilization of electron scan microscope for the study of composite materials with organic matrix
N75-23708

S

SAFETY DEVICES
Design recommendation for a lightning elimination system for FAA category 3 instrument landing system, NAFEC, Atlantic City, New Jersey
[AD-A008933] N75-23609
Development and evaluation of automobile crash sensors
[PB-237940/2] N75-23939

SAFETY MANAGEMENT
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 1: Summary report --- systems management evaluation and design analysis
[NASA-TM-X-66814] N75-23644
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 2: Program implementation and maturi-

ty --- systems management evaluation and design analysis
[NASA-TM-X-66815] N75-23645
Minutes of the 16th Explosives Safety Seminar, volume 1 --- including ammunition and propellant storability
[AD-A007557] N75-23801
Minutes of the 16th Explosives Safety Seminar, volume 2 --- including ammunition and propellant storability
[AD-A007566] N75-23802
Toxic substances alert program
[NASA-TM-X-71711] N75-24319

SALINITY
Irrigation scheduling, freeze warning and soil salinity detecting --- in Cameron County Texas
[E75-10285] N75-24058

SAMARIUM
Magnetic properties of neodymium-samarium-cobalt alloys
[AD-A007848] N75-24520

SAMPLERS
An automated approach to some basic sample handling concepts
N75-23721

SAMPLING
Theory and practice of geophysical survey design --- track-type geophysical surveys and algorithms applied to sampling problems
N75-24203

SATELLITE ANTENNAS
Development of new space lubricants --- for despin satellite antenna drive bearings
N75-23997

SATELLITE CONFIGURATIONS
Dynamic analysis of a satellite with deformable parts --- GEOS satellite dynamic model for attitude control system design
[ESRO-SR-22-ESTEC] N75-23670

SATELLITE DESIGN
Essentials of the theory of flight and elements of designing artificial earth satellites
[NASA-TT-F-16220] N75-23637

SATELLITE INSTRUMENTS
Presentation of tests on gears performed at CNES
N75-24015

SATELLITE OBSERVATION
Study of USGS/NASA land use classification system --- computer analysis from LANDSAT data
[NASA-CR-120763] N75-24069
HEOS 2 plasma observations in the distant polar magnetosphere: The plasma mantle
[MPI-PAE/EXTRATERR-108] N75-24207
Analysis of ERTS-A satellite photos for NOAA-AOML study to detect ocean eddies [sic]
[COM-75-10192/3] N75-24282
Copernicus observations of Betelgeuse and Antares
[NASA-CR-142815] N75-24598
Magnetic field of the planet Mars based on Mars-3 and Mars-5 satellite data
[NASA-TT-F-16550] N75-24614
Solar geophysical data number 364, December 1974. Part 1 [prompt reports], data for November 1974, October 1974
[COM-74-50190/364-1] N75-24647
Solar geophysical data number 364, December 1974. Part 2 [comprehensive reports] Data for June 1974 - May 1974 and miscellanea
[COM-74-50190/364-2] N75-24648

SATELLITE PERTURBATION
Perturbation of a planetary orbiter by radiation pressure, account being taken of variation in the distance and direction of the sun
[ESRO-SR-24-ESOC] N75-23639

SATELLITE SOLAR POWER STATIONS
Feasibility study of a satellite solar power station
[NASA-CR-2357] N75-23683

SATELLITE TRACKING
Design study for a sensor utilizing an electrostatic camera. Volume 2: Appendices
[AD-A007070] N75-23940
Direct recovery of mean gravity anomalies from satellite to satellite tracking
N75-24201

SATELLITE TRANSMISSION
Data processor sizing for an Aeronautical Satellite Communications Center [ASCC]
[AD-A007624] N75-24408

SATELLITE-BORNE INSTRUMENTS
Earth radiation budget measurement from a spinning satellite: Conceptual design of detectors
[NASA-CR-132494] N75-23920

SCALE MODELS
Thermal strain determination using gages imbedded in plastic material mock-ups under time-dependent temperature variations
N75-23918

SCALING LAWS
The flux of particle loss in a permeable plasma
[TRITA-EPP-74-20] N75-24483

SCANNERS
Design, evaluation and applications of a vidicon rapid scanning spectrophotometer
N75-23913

SCATTERING AMPLITUDE
Tables of scattering amplitudes, spin polarizations and phase shifts of 25 eV to 1500 eV electrons scattered elastically from Li, Na, Mg, P, K, Ca, Sc, Mn, Ga, Br, Sr, Mo, Rh, Cd, Ba, W, and Os, 3
[AD-A007055] N75-23739
Electron laser-pulse scattering
N75-23961
Properties of scattering amplitudes at very high energies
[NASA-CR-142762] N75-24445

SCATTERING CROSS SECTIONS
Properties of scattering amplitudes at very high energies
[NASA-CR-142762] N75-24445

SCHEDULING
Optimal scheduling of homogeneous job systems
[PB-238972/4] N75-24402

SCHLIEREN PHOTOGRAPHY
Application of mode locked solid state lasers to photographic investigation of transient phenomena
N75-23806

SCHOTTKY DIODES
Performance improvement of a field effect transistor with Schottky barrier on GaAs
[MB/DL-CRL-32/43] N75-24500

SCORPIUS CONSTELLATION
Temporal X-ray astronomy with a pinhole camera --- cygnus and scorpius constellation
[NASA-TM-X-70893] N75-24596

SEA ICE
Differential sea ice drift
[AD-A007733] N75-24048
An experimental investigation of the boundary layer under pack ice
[AD-A007335] N75-24049

SEA STATES
Bistatic radar sea state monitoring field test
[NASA-CR-141394] N75-23919
Calculations of the heights, periods, profile parameters, and energy spectra of wind waves
N75-24276
SPLASH programs user's guide
[COM-75-10181/6] N75-24288

SEA WATER
Physics of the sea and atmosphere
[NASA-TT-F-16225] N75-24262
Recent changes in the ocean level
N75-24263
Microconvection in evaporation and microconvection in ice formation
N75-24268
An example of the use of laboratory results in the optics of the sea
N75-24273
Temperature waves in a stratified sea
N75-24277

SEARCH PROFILES
Search service on Government Reports Announcements [GRA] magnetic tapes at the Swedish National Defence Research Institute [FOA]
[PB-238957/5] N75-24411

SEAT BELTS
A crashworthy armored pilot seat for helicopters
[AD-A007551] N75-23541

SEDIMENTS
Hydraulic and flow studies related to sediment transport, Kentucky River, Kentucky
[PB-239259/5] N75-24092

SEISMIC WAVES
Seismic properties of the Mohorovicic discontinuity
[TT-74-50029] N75-24219
Seismic waves
[TT-74-50021] N75-24220
Strong motion earthquake accelerograms digitized and plotted data. Volume 1: Uncorrected accelerograms, part R: Accelerograms IR244 through IR254. Accelerograms from the San Fernando, California earthquake of 1971
[PB-239585/3] N75-24223
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement Curves. Parts O and P: Accelerograms IIO198 to IIO201, IIO204 to IIO208, IIO210, IIO213, IIP214 to IIP223, and IIP232
[PB-239586/1] N75-24224
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement curves. Part Q and R: Accelerograms IIQ233 to IIQ243 and IIR244 to IIR254
[PB-239587/9] N75-24225

SEISMOGRAMS
Strong motion earthquake accelerograms digitized and plotted data. Volume 1: Uncorrected accelerograms, part R: Accelerograms IR244 through IR254. Accelerograms from the San Fernando, California earthquake of 1971
[PB-239585/3] N75-24223

SEISMOGRAPHS
Unmanned seismological observatory: Seismometers and signal processing
[SAND-74-0205] N75-24213
Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement Curves. Parts O and P: Accelerograms IIO198 to IIO201, IIO204 to IIO208, IIO210, IIO213, IIP214 to IIP223, and IIP232
[PB-239586/1] N75-24224

SEISMOLOGY
Unmanned seismological observatory: Seismometers and signal processing
[SAND-74-0205] N75-24213
Seismic properties of the Mohorovicic discontinuity
[TT-74-50029] N75-24219
Seismic waves
[TT-74-50021] N75-24220

SELENIUM
Minority carrier kinetics in defect trap distributions in semiconductors: Application to trigonal selenium single crystals
N75-24497

SELF LUBRICATING MATERIALS
The friction and wear of self lubricating polythenes
N75-23998
Composite self lubricating materials for space applications
N75-24005

SEMICONDUCTOR DEVICES
Aluminum ribbon and round wire bonding: Comparative analysis
[AD-A007513] N75-23777
Electron beam semiconductor device with mesa diode, reliability and failure determination
[AD-A007277] N75-23860
Diffusion length measurements using the scanning electron microscope --- in semiconductor devices
[NASA-TM-X-71724] N75-24014
Ion implantation sources and source materials
[AD-A007431] N75-24516

SEMICONDUCTOR JUNCTIONS
Applied research on 2 - 6 compound materials for heterojunction solar cells
[PB-239184/5] N75-24146
Glass-Si heterojunction solar cells
[PB-239282/7] N75-24156

SEMICONDUCTORS [MATERIALS]
Minority carrier kinetics in defect trap distributions in semiconductors: Application to trigonal selenium single crystals
N75-24497
Ion implantation of diatomic sulfur into GaAs
[AD-A006801] N75-24514
Some electrical and photoelectrical properties of CdSnP2 single crystals
[AD-A007863] N75-24517
Thermoelectric properties of ceramic refractory semiconductors
[AD-A007862] N75-24519

SEPARATED FLOW
Supersonic laminar boundary layer flow past a wavy wall with multiple separation regions
[AD-A007433] N75-23905

SEQUENCING
The design of multiple-valued asynchronous sequential circuits
N75-23846

SEQUENTIAL CONTROL
An automated molecular fluorescence/absorption sequential analyzer with laser source
N75-23911

SERVICE LIFE
Grease lubricated spiral groove bearings for long-life systems --- communication satellite momentum wheel
N75-24003

SET THEORY
Application of internal analysis to problems of linear control systems --- boundary value problems and set theory
N75-24413

SHAFTS [MACHINE ELEMENTS]
A technique for determining the accuracy of an incremental shaft encoder --- phased locked systems
[AD-A007781] N75-23945

SHEAR FLOW
Observations of short period internal waves generated by shear flow instability --- temperature gradients
N75-23871
Problems in nonlinear mechanics of unstable waves in turbulent and in stratified shear flows. Part 1: Development of the noise-producing large-scale structure in a turbulent jet. Part 2: Nonlinear KelvinHelmholtz waves and the vertical mixing mechanism in a stratified shear flow. Part 3: Nonlinear interactions of the large-scale coherent structure and turbulence in a free shear flow
N75-23874
Drift wave instabilities in plasmas with shear flow
[MPI-PAE/EXTRATERR-106] N75-24476

SHEAR STRAIN
Account of shearing strain during the calculation of the oscillations of low aspect-ratio wing by the method of polynomials
[AD-A007397] N75-23518

SHEAR STRESS
Design and fabrication of Rene 41 advanced structural panels --- their performance under axial compression, shear, and bending loads
[NASA-CR-132646] N75-24032

SHELLS [STRUCTURAL FORMS]
Vibration analysis of skewed cantilever systems: Helicoidal shells and plates
N75-24026

SHIP HULLS
Studies and research on marine hulls working with natural ground effect
N75-23475

SHIPS
Wave induced motions and loads on ships in oblique waves
[REPT-193-S] N75-23810
Electronic docking systems
[COM-75-10139/4] N75-23869

SHOCK
The cause of death resulting from transfusion resistant shock. Part 1: Influence of brain damage
[MBL-1975-1] N75-24330

SHOCK WAVE INTERACTION
Unsteady behavior of transonic flows --- shock induced oscillation
[MPIS-MITT-59] N75-23516
Interaction of shock wave with wedge, which moves at supersonic speed
[AD-A007302] N75-23519

SHOCK WAVES
Flows with lambda-shaped shocks at the entrance into plane supersonic air inlet
[AD-A007458] N75-23907
Inelastic response of ring-stiffened cylindrical shells to external pressure shock waves
[AD-A007329] N75-24041
Shock waves in hydrogen isotopes and their high pressure equation of state
[UCRL-75727] N75-24513

SHORT CIRCUITS
Functioning of power rectifiers and thyristors from 1 January 1970 to 31 December 1972, noting carrier injection, emitter shorts, ignition, and breakdown
[NASA-TT-F-16365] N75-23850

SHORT TAKEOFF AIRCRAFT
Calculation of static longitudinal aerodynamic characteristics of STOL aircraft with upper surface blown flaps
[NASA-CR-137646] N75-23483
A Kalman filter for the Stoland system
[NASA-CR-137668] N75-23543
A formal structure for advanced automatic flight-control systems
[NASA-TN-D-7940] N75-23606

SHOT PEENING
An investigation of the effect of shot peening on the rotating bending fatigue endurance of chromium plated 18% Ni maraging steel
[AQD/U-000667] N75-23773

SIDE-LOOKING RADAR
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-1] N75-24064

SIGNAL GENERATORS
Finite difference methods for transient signal propagation in stratified dispersive media
N75-24427

SIGNAL PROCESSING
Proceedings of the Canadian Workshop on acoustic surface waves --- signal processing and wave propagation
[CRC-R-1260] N75-23821
Tactical communication systems --- signal processing and switching theory
[AD-A007260] N75-23833
A maximum entropy filter --- a discussion of fast Fourier transformations and signal processing
[AD-A007482] N75-23834
Correlation modulation --- data correlation
[AD-A007338] N75-23837
Unmanned seismological observatory: Seismometers and signal processing
[SAND-74-0205] N75-24213
Proceedings of the Symposium on Digital Signal Processing
[SAND-74-8672] N75-24372

SIGNATURE ANALYSIS
On the statistical analysis of the radar signature of the MQM-34D
[AD-A007765] N75-23552

SILICON
Effects of silicon additions on oxidation and mechanical behavior of the nickel-base superalloy B-1900
[NASA-TN-D-7989] N75-23761
Characterization of implanted silicon by Raman and infrared spectrocopy
N75-24013
Effects of high doping levels silicon solar cell performance
[NASA-TM-X-71728] N75-24117
V-grooved silicon solar cells
[NASA-TM-X-71715] N75-24119
Studies of the effects of radiations
[COO-125-57] N75-24449
The effects of topology on the properties of random network models for amorphous Group 4 semiconductors --- germanium, silicon, and energy bands
N75-24495
SbSI physical properties near the ferroelectric phase change point
N75-24501
Application of the MOS-C-V technique to determine impurity concentrations and surface parameters on the diffused face of silicon solar cells
[NASA-TM-X-71721] N75-24505

SILICON CARBIDES
Electron microscopic observations of microcracking about indentations in aluminum oxide and silicon carbide
[AD-A007445] N75-23794

SILICON NITRIDES
Silicon nitride for structural applications: An annotated bibliography
[AD-A007270] N75-23791

SILVER
Water hyacinths and alligator weeds for removal of silver, cobalt, and strontium from polluted waters
[NASA-TM-X-72727] N75-24163

SIMULATORS
Aircraft engine nacelle fire test simulator
[AD-A007853] N75-23617

SINGLE CRYSTALS
Research on the influence of dislocations on the diffraction of X rays and gamma rays on copper single crystals
N75-23751
Electronic tunneling and structure of superconducting niobium single crystals
[AD-A007580] N75-24515
Some electrical and photoelectrical properties of CdSnP2 single crystals
[AD-A007863] N75-24517

SINTERING
Optimal densification of ceramics by rate controlled sintering
[AD-A007339] N75-23792
Contact resistance studies of sintering using ultra clean copper surfaces in ultra high vacuum
N75-23983
Densification-mechanism modeling of the pressure-sintering behavior of MgAl2O4
N75-23984

SKYLAB PROGRAM
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 1: Summary report --- systems management evaluation and design analysis
[NASA-TM-X-66814] N75-23644
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 2: Program implementation and maturity --- systems management evaluation and design analysis
[NASA-TM-X-66815] N75-23645
Analysis of Skylab fluid mechanics science demonstrations
[NASA-CR-120765] N75-23888
Experimental investigation and model development of the Skylab ATM secondary nickel-cadmium batteries
[NASA-CR-120749] N75-24097
History of manned space flight
[NASA-TM-X-66817] N75-24641

SLIDING FRICTION
The background to current theories of scuffing --- a study of boundary lubrication, sliding friction, and elastohydrodynamics
[S/T-MEMO-5/73] N75-23991
Lubrication breakdown under boundary conditions --- sliding friction and a failure analysis
N75-23993
Metallurgical aspects of scuffing --- strain hardening and steels
N75-23995

SMOG
Mathematical simulation of smog chamber photochemical experiments
[PB-238094/7] N75-24180
Analysis of the composition of the atmosphere in the Los Angeles Basin
[PB-239466/6] N75-24199

SMOKE
Smoke hazards from burning plastics
[UCRL-76015] N75-23809
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, May 1973
N75-24165
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, Jun. 1973
N75-24166

SNOW
Simulated snowdrift patterns: Evaluation of geometric modeling criteria for a three dimensional structure
[AD-A007735] N75-24050
A digital computer simulation of the annual snow and soil thermal regimes at Barrow, Alaska
[AD-A007734] N75-24082
Red and near-infrared spectral reflectance of snow
[AD-A007732] N75-24085
A stochastic snow model --- using Poisson process
N75-24227

SNOW COVER
Temperature field and heat flow in snow cover
[TT-71-51011] N75-24086

SOCIAL FACTORS
Standardization of objective medico-psychiatric questionnaire in the French Army
N75-24307
Highway travel forecasts
[PB-239169/6] N75-24549

SOCIOLOGY
The problem of integration in the cybernetic system theory of Karl Deutsch
N75-24521

SODIUM
System evaluation of solid chemical oxygen generators --- using sodium chlorate candles
[AD-A007691] N75-23690
Thermodynamic properties and phase diagram of ternary sodium alloys. 1: The system sodium plus cadmium plus indium
[PEL-230] N75-23730

SODIUM CHLORIDES
Corrosion fatigue of type 304 stainless steel in H2SO4 + NaCl at 25 C
N75-23748

SODIUM COMPOUNDS
Sodium sulfate: Vaporization thermodynamics and role in corrosive flames
[NASA-TM-X-71641] N75-23752

SOIL MAPPING
Investigation of multispectral techniques for remotely identifying terrain features and natural materials
[PB-238675/3] N75-24078

SOILS
Irrigation scheduling, freeze warning and soil salinity detecting --- in Cameron County Texas
[E75-10285] N75-24058
Ground truth procedures, Phoenix soil moisture
[NASA-CR-143795] N75-24066
Manganese in Virginia soils and correction of manganese deficiency in soybeans [Glycine max L.]
N75-24071
A digital computer simulation of the annual snow and soil thermal regimes at Barrow, Alaska
[AD-A007734] N75-24082
Slope stability analysis: A computerized solution of Bishop's simplified method of slices
[PB-238954/2] N75-24548

SOLAR ACTIVITY
Solar geophysical data number 364, December 1974. Part 1 [prompt reports], data for November 1974, October 1974
[COM-74-50190/364-1] N75-24647
Solar geophysical data number 364, December 1974. Part 2 [comprehensive reports] Data for June 1974 - May 1974 and miscellanea
[COM-74-50190/364-2] N75-24648

SOLAR ARRAYS
A structural dynamics model for flexible solar arrays of the communications technology satellite
[CRC-1268] N75-24034
Cost competitiveness of a solar cell array power source for ATS-6 educational TV terminal
[NASA-TM-X-71720] N75-24110

SOLAR CELLS
Effect of electron irradiation in vacuum on FEP-A silicon solar cell covers
[NASA-TM-X-71713] N75-23668
Summary of high efficiency silicon solar cell meeting held at NASA-Lewis
[NASA-TM-X-71729] N75-23681
Feasibility study of a satellite solar power station
[NASA-CR-2357] N75-23683
Photovoltaic solar power systems
N75-24098
Space satellite power system --- conversion of solar energy by photovoltaic solar cell arrays
[NASA-CR-142799] N75-24099
The high intensity solar cell: Key to low cost photovoltaic power
[NASA-TM-X-71718] N75-24108
The effect of sunshine testing on terrestrial solar cell system components
[NASA-TM-X-71722] N75-24109
Advances in the theory and application of BSF cells --- including electrical resistivity and photovoltaic cells
[NASA-TM-X-71723] N75-24112
Effects of high doping levels silicon solar cell performance
[NASA-TM-X-71728] N75-24117
V-grooved silicon solar cells
[NASA-TM-X-71715] N75-24119

Terrestrial photovoltaic power systems with sunlight concentration
[PB-238506/0] N75-24136
Applied research on 2 - 6 compound materials for heterojunction solar cells
[PB-239184/5] N75-24146
Glass-Si heterojunction solar cells
[PB-239282/7] N75-24156
Research on cadmium stannate selective optical films for solar energy applications
[PB-239372/6] N75-24159
Application of the MOS-C-V technique to determine impurity concentrations and surface parameters on the diffused face of silicon solar cells
[NASA-TM-X-71721] N75-24505

SOLAR COLLECTORS
Survey of coatings for solar collectors --- ceramic enamels and chromium
[NASA-TM-X-71730] N75-23989
Outdoor flat-plate collector performance prediction from solar simulator test data
[NASA-TM-X-71707] N75-24111
Standardized solar simulator tests of flat plate solar collectors. 1: Soltex collector with two transparent covers
[NASA-TM-X-71738] N75-24118

SOLAR COSMIC RAYS
Some results of investigation of solar cosmic rays on board Mars-7 station
[NASA-TT-F-16353] N75-24645

SOLAR ELECTRIC PROPULSION
Natural environment design criteria for the Solar Electric Propulsion Stage [SEPS]
[NASA-TM-X-64929] N75-23682

SOLAR ELECTRONS
Report on the Brookhaven solar neutrino experiment
[BNL-19278] N75-24652

SOLAR ENERGY
Electric power for space satellites
[NASA-TM-X-66808] N75-23678
Energy: A continuing bibliography with indexes, February 1975 --- solar energy, energy conversion
[NASA-SP-7043(03)] N75-24094
Oceanic and atmospheric energy sources
N75-24101
The national solar energy program
N75-24102
Solar energy research and development
[GPO-40-684] N75-24104
V-grooved silicon solar cells
[NASA-TM-X-71715] N75-24119
Terrestrial photovoltaic power systems with sunlight concentration
[PB-238506/0] N75-24136
Proceedings of 5th annual symposium: Energy Research and Development --- solar energy, windpower utilization, thermonuclear power generation
[AD-A007799] N75-24142
A preliminary technology assessment of ocean thermal gradient energy generation
[PB-238646/4] N75-24147
Symposium on the Material Science Aspects of Thin Film Systems for Solar Energy Conversion
[PB-239270/2] N75-24150
Solar energy for process steam generation
[PB-238109/3] N75-24154

SOLAR ENERGY ABSORBERS
Workshop Proceedings on Solar Cooling for buildings, held in conjunction with the Semiannual Meeting of the American Society of Heating, Refrigerating and Air Conditioning Engineers [ASHRAE]
[PB-239419/5] N75-24145

SOLAR ENERGY CONVERSION
Photovoltaic solar power systems
N75-24098
Space satellite power system --- conversion of solar energy by photovoltaic solar cell arrays
[NASA-CR-142799] N75-24099
Solar photothermal power conversion
N75-24100
The national solar energy program
N75-24102
The energy plantation
N75-24103
Photochemical conversion of solar energy
[PB-238533/4] N75-24132
Chemical vapor deposition research for fabrication of solar energy converters
[PB-238947/6] N75-24137
Symposium on the Material Science Aspects of Thin Film Systems for Solar Energy Conversion
[PB-239270/2] N75-24150
Proceedings of the Solar Thermal Conversion Workshop
[PB-239277/7] N75-24157

SOLAR FLARES
An analysis of imperfections in DMSP photographs caused by high energy solar and trapped protons
[AD-A007679] N75-24249
Some results of investigation of solar cosmic rays on board Mars-7 station
[NASA-TT-F-16353] N75-24645
Solar gamma-ray lines as probes of accelerated particle directionalities in flares
[NASA-TM-X-70890] N75-24646
Solar geophysical data number 364, December 1974. Part 1 [prompt reports], data for November 1974, October 1974
[COM-74-50190/364-1] N75-24647
Solar geophysical data number 364, December 1974. Part 2 [comprehensive reports] Data for June 1974 - May 1974 and miscellanea
[COM-74-50190/364-2] N75-24648

SOLAR FLUX
Radiative transfer between surfaces with spectral, directional, and temperature dependent properties --- radiative heat transfer of tungsten by collimated solar flux
N75-23873
Measurements of ion fluxes using RIEP-2801 M instrument on board Mars-4 and Mars-5 automatic interplanetary stations
[NASA-TT-F-16352] N75-24606

SOLAR GENERATORS
Chemical vapor deposition research for fabrication of solar energy converters
[PB-238947/6] N75-24137
Proceedings of the Solar Thermal Conversion Workshop
[PB-239277/7] N75-24157

SOLAR HEATING
The development of a solar residential heating and cooling system
[NASA-CR-142728] N75-24107

SOLAR ORBITS
Jupiter: Giant of the solar system --- its solar orbits
[NASA-TM-X-66827] N75-24631

SOLAR PHYSICS
Feasibility studies on the radiochemical lithium solar neutrino experiment
[BNL-19300] N75-24442

SOLAR RADIATION
Wide angle sun sensor --- consisting of cylinder, insulation and pair of detectors
[NASA-CASE-NPO-13327-1] N75-23910
Solar gamma ray monitor for OSO-H [0.3-10 MeV]
[NASA-CR-143799] N75-23922
Solar activity and the motions of the upper atmosphere
N75-24267
Distribution of energy in the ocean and atmosphere as a result of their thermal and dynamic interactions
N75-24280
Measurement of intensity and spectral characteristics of radiation in the Lyman-alpha line in the upper Martian atmosphere
[NASA-TT-F-16339] N75-24612

SOLAR SIMULATORS
Outdoor flat-plate collector performance prediction from solar simulator test data
[NASA-TM-X-71707] N75-24111
Standardized solar simulator tests of flat plate solar collectors. 1: Soltex collector with two transparent covers
[NASA-TM-X-71738] N75-24118

SOLAR SPECTRA
Variation of solar-selective properties of black chrome with plating time
[NASA-TM-X-71731] N75-23753
A table of semiempirical gf values. Part 1: Wavelengths: 5.2682 nm to 272.3380 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142879] N75-24599
A table of semiempirical gf values. Part 2: Wavelengths: 272.3395 nm to 599.3892 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142880] N75-24600
A table of semiempirical gf values. Part 3: Wavelengths: 599.4004 nm to 9997.2746 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142881] N75-24601

SOLAR SYSTEM
Jupiter: Giant of the solar system --- its solar orbits
[NASA-TM-X-66827] N75-24631

SOLAR WIND
Investigation of solar plasma near Mars and on Earth-Mars path by means of a charged-particle trap aboard Soviet spacecraft, 1971 - 1973. Part 3: Characteristics of plasma ion and electron components in the antisolar part of near-Martian space measured by Mars-5
[NASA-TT-F-16351] N75-24611

SOLENOIDS
Temperature fields of an absorptive medium in a radiating system of arbitrary configuration [the spatial problem]
N75-24271

SOLID LUBRICANTS
Graphite fluoride lubrication: The effect of fluorine content, atmosphere, and burnishing technique
[NASA-TM-X-71733] N75-23988
Sacrificial cage materials for the in-situ lubrication of rolling bearings --- accelerated service-simulation testing
N75-23999
On the effects of solid lubrication on the torque of a ball bearing --- D2B satellite
N75-24000
Method for continuous torque measurement of dry miniature bearings --- using microbalance
N75-24006
A dry lubrication system for spaceproofed bearings --- Helios despin drives
N75-24008

SOLID PROPELLANT ROCKET ENGINES
Hydrodynamic stability evaluation of an 0.088-scale solid rocket booster model --- recovery by towing in various sea states
[AD-A007477] N75-23686
Complex metal hydrides: High energy fuel components for solid propellant rocket motors
[AD-A007353] N75-23779

SOLID ROCKET PROPELLANTS
Attitude control propulsion components, volume 2
[NASA-CR-136741-VOL-2] N75-23677
Non-linear fracture mechanics: New theories of solid propellant response and fracture behaviors
[AD-A007334] N75-23800

SOLID STATE LASERS
Application of mode locked solid state lasers to photographic investigation of transient phenomena
N75-23806

SOLIDIFIED GASES
System evaluation of solid chemical oxygen generators --- using sodium chlorate candles
[AD-A007691] N75-23690
Behavior of atomic H in solid H2 from 0.2 to 0.8 K
[NASA-TM-X-71732] N75-24440
Nuclear magnetic resonance studies of solid hydrogen under high pressure
N75-24498

SOLUBILITY
Studies on immiscible alloys --- the processing of galium-bismuth in a low-gravity environment
[NASA-CR-120764] N75-23759

SOLVENT EXTRACTION
Technology and use of lignite
[PB-238666/2] N75-24131

SONDES
French participation in the EXAMETNET program operational implementation
[NASA-TT-F-16388] N75-24230

SONIC BOOMS
Psychophysical tests of potential design/certification criteria for advanced supersonic aircraft --- human noise tolerance
[AD-A009296] N75-24354

SOUND TRANSMISSION
Nonlinear acoustics. Part 1: Physical phenomena, exact basic equations, and problems in formulation and solution of approximate equations
[AD-A002997] N75-24434

SOUND WAVES
Complex waveform phonetic speech synthesis
N75-23814
Proceedings of the Canadian Workshop on acoustic surface waves --- signal processing and wave propagation
[CRC-R-1260] N75-23821
The distribution of jet source strength intensity by means of a direct correlation technique --- far and near fields
N75-23872
Real-time wavefront correction through Bragg diffraction of light by sound waves
N75-24433

SOUNDING
Estimation of mixing ratio profiles over maritime areas by linear regression methods
[AD-A007654] N75-24217

SOUNDING ROCKETS
French participation in the EXAMETNET program operational implementation
[NASA-TT-F-16388] N75-24230

SOUTH AFRICA
Field studies and remote sensing along the Natal Coast, South Africa
[AD-A007285] N75-24084

SOUTHERN CALIFORNIA
Fault tectonics and earthquake hazards in the Peninsular Ranges, Southern California --- Mojave Desert
[E75-10284] N75-24057

SOYBEANS
Manganese in Virginia soils and correction of manganese deficiency in soybeans [Glycine max L.]
N75-24071

SOYUZ SPACECRAFT
The Soyuz: Ready for flight
[NASA-TT-F-16369] N75-23646
Soyuz-16: Biological experiments
[NASA-TT-F-16356] N75-24293

SPACE ENVIRONMENT SIMULATION
Sacrificial cage materials for the in-situ lubrication of rolling bearings --- accelerated service-simulation testing
N75-23999

SPACE EXPLORATION
In outer space
[NASA-TT-F-16252] N75-23625
Venus and Mercury encounters
[NASA-CR-142829] N75-24630

SPACE FLIGHT
Collection of problems on the dynamics of a point in a central force field
[NASA-TT-F-16263] N75-23633

SPACE LABORATORIES
Experiment definition phase shuttle laboratory LDRL-10.6 experiment --- using a molniya satellite and ground communication links
[NASA-CR-143746] N75-23652

SPACE MAINTENANCE
Manned systems utilization anaylsis. Study 2.1: Space servicing pilot program study --- for automated payloads
[NASA-CR-142758] N75-23620

SPACE MANUFACTURING
Undercooling of materials during solidification in space
[NASA-CR-120750] N75-23624

SPACE MECHANICS
Collection of problems on the dynamics of a point in a central force field
[NASA-TT-F-16263] N75-23633
Graphics of space mechanics analytical-graphical methods in space navigation
[NASA-TT-F-16298] N75-23636

SPACE MISSIONS
On the electric propulsion/mission system: Energy, constraints, and characteristic surfaces --- for low thrust space flight
N75-23674
Natural environment design criteria for the Solar Electric Propulsion Stage [SEPS]
[NASA-TM-X-64929] N75-23682

SPACE NAVIGATION
Post-test navigation data analysis techniques for the shuttle ALT
[NASA-CR-141789] N75-23629
Graphics of space mechanics analytical-graphical methods in space navigation
[NASA-TT-F-16298] N75-23636

SPACE PROBES
Preliminary results of research conducted aboard the Soviet Mars-4, Mars-5, Mars-6, and Mars-7 planetary probes
[NASA-TT-F-16333] N75-24615

SPACE SHUTTLE ORBITERS
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [iA14B], volume 1
[NASA-CR-141522] N75-23647
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [IA14B], volume 2
[NASA-CR-141523] N75-23648
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the 11-foot unitary plan wind tunnel for Mach 0.6 and 0.9 [0A22A]
[NASA-CR-141529] N75-23649
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the arc 9 by 7-foot unitary plan wind tunnel for Mach 1.55 and 2.2 [OA22B]
[NASA-CR-141530] N75-23650
Abort separation study of a shuttle orbiter and external tank at hypersonic speeds
[NASA-TM-X-3212] N75-23651
Source encoding for orbiter communications links
[NASA-CR-141792] N75-23653
Space LOX vent system --- for space shuttle orbiter
[NASA-CR-120769] N75-23685
Design of a digital voice data compression technique for orbiter voice channels
[NASA-CR-141790] N75-23820
Development and validation of methods for man-made machine interface evaluation --- for shuttles and shuttle payloads
[NASA-CR-142824] N75-24359

SPACE SHUTTLES
Post-test navigation data analysis techniques for the shuttle ALT
[NASA-CR-141789] N75-23629
Experiment definition phase shuttle laboratory LDRL-10.6 experiment --- using a molniya satellite and ground communication links
[NASA-CR-143746] N75-23652
Space shuttle entry and landing navigation analysis
[NASA-CR-141765] N75-23654
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 3
[NASA-CR-134445] N75-23657
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 4
[NASA-CR-134446] N75-23658
Airloads investigation of an 0.30-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 5
[NASA-CR-134447] N75-23659
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 6
[NASA-CR-134448] N75-23660
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 7
[NASA-CR-134449] N75-23661
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the arc 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 8
[NASA-CR-134450] N75-23662
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 9
[NASA-CR-141501] N75-23663
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140 A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for MACH range 0.6 to 1.4 [IA14A], volume 10
[NASA-CR-141502] N75-23664
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 11
[NASA-CR-141503] N75-23665
Results of transonic wind tunnel tests on an 0.010-scale space shuttle mated vehicle model 72-OTS in the LaRC 8-foot TPT [IA43]
[NASA-CR-141525] N75-23666
Evaluation of dispersion strengthened nickel-base alloy heat shields for space shuttle application
[NASA-CR-132615] N75-23667
Hydrazine gas generator program --- space shuttles
[NASA-CR-141795] N75-23680
Assessment of possible environmental effects of space shuttle operations
[NASA-CR-129003] N75-24162
Phase 1 engineering and technical data report for the thermal control extravehicular life support system
[NASA-CR-141793] N75-24360

SPACE SURVEILLANCE [GROUND BASED]
The Anchorage, Alaska, real time auroral radar monitor: System description and some preliminary analyses
[COM-75-50114/8] N75-24241

SPACE TUGS
Astrionic system optimization and modular astrionics for NASA missions after 1974. Preliminary definition of astrionic system for space tug Mission Vehicle Payload [MVP]
[NASA-CR-120618] N75-23627

SPACEBORNE ASTRONOMY
Data user's notes of the radio astronomy experiment aboard the OGO-V spacecraft
[NASA-CR-143696] N75-24593

SPACEBORNE PHOTOGRAPHY
A survey of earth resources on Apollo 9 photography
[NASA-CR-142900] N75-24063

SPACEBORNE TELESCOPES
Astronomy at sub-millimeter wavelengths --- using telescopes mounted on gondolas
[NASA-CR-142814] N75-23927

SPACECRAFT COMMUNICATION
Health care and satellite radio communication in village Alaska
[PB-238742/1] N75-24343

SPACECRAFT COMPONENTS
The Soyuz and Apollo spacecraft
[NASA-TT-F-16371] N75-23622
Interplanetary charged particle models [1974] --- and the effects of cosmic exposure upon spacecraft and spacecraft components
[NASA-SP-8118] N75-24607

SPACECRAFT DESIGN
Korolev: A chronicle --- a biography of Sergey Pavlovich Korolev
[NASA-TT-F-16278] N75-24654

SPACECRAFT ENVIRONMENTS
Possible applications of surface treatment to ultrahigh vacuum friction for space utilization
N75-23626
On the effects of solid lubrication on the torque of a ball bearing --- D2B satellite
N75-24000
Composite self lubricating materials for space applications
N75-24005
A dry lubrication system for spaceproofed bearings --- Helios despin drives
N75-24008

SPACECRAFT INSTRUMENTS
Research and development in the field of spacecraft mechanical devices --- collector rings and bearings
N75-24007

SPACECRAFT LUBRICATION
Development of new space lubricants --- for despin satellite antenna drive bearings
N75-23997

SPACECRAFT MANEUVERS
Contributions to the calculation of satellite transfer from near-earth to geostationary orbits by small thrust-acceleration in regularised variables
[ESRO-TT-138] N75-23638

SPACECRAFT STERILIZATION
Planetary quarantine: Supporting research and technology
[NASA-CR-142878] N75-24362

SPACECRAFT STRUCTURES
The use of carbon fibre reinforced plastics in satellite structures. Volume I: Summary
[HSD-TP-7509-VOL-1-SUMM] N75-23713

SPACECRAFT TRACKING
Results of the 3 November 1974 Applications Technology Satellite-6 [ATS-6] trilateration test
[NASA-TM-X-70897] N75-23656

SPALLING
Calculations of laser induced spall in aluminum targets
[LA-5619-MS-REV] N75-23968

SPATIAL DISTRIBUTION
An analysis of droplet size distribution during monopropellant spray combustion
N75-23799

SPATIAL FILTERING
The space bandwidth produce of multi-channel coherent processes
[AD-A007775] N75-23955

SPECIFIC HEAT
Thermophysical properties of matter and substances, Volume 2 --- thermal conductivity, critical temperature, critical point, specific heat, and thermal expansion
[TT-72-52001-VOL-2] N75-23738

SPECIFICATIONS
Electromagnetic interference specification limits for air route traffic control centers
[AD-A008926] N75-23547

SPECTRAL LINE WIDTH
Transmissivity of carbon monoxide in the 2.3 microns band region
[NASA-CR-142869] N75-23726

SPECTRAL REFLECTANCE
Red and near-infrared spectral reflectance of snow
[AD-A007732] N75-24085
An example of the use of laboratory results in the optics of the sea
N75-24273

SPECTRAL RESOLUTION
High resolution spectral analysis with arbitrary spectral centers and adjustable spectral resolutions
[AD-A007483] N75-23838

SPECTROPHOTOMETERS
Design, evaluation and applications of a vidicon rapid scanning spectrophotometer
N75-23913

SPECTROPHOTOMETRY
Spectrophotometry of Mars in the 2-5 micrometer range on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16345] N75-24620

SPECTROSCOPIC ANALYSIS
On the relative merits of using either CW helium-cadmium or pulsed nitrogen lasers as the flourescence excitation source in airborne laser flourosensing systems
[PB-238845/2] N75-23974

SPECTROSCOPIC TELESCOPES
ITS-K infrared cryogenic telescope-spectro-meter aboard Salyut-4
[NASA-TT-F-16355] N75-23936

SPECTRUM ANALYSIS
High resolution spectra of rare earth crystals
[AD-A007262] N75-23732
High resolution spectral analysis with arbitrary spectral centers and adjustable spectral resolutions
[AD-A007483] N75-23838
Comparison of two nucleus spectrum measuring devices and the influence of several variables on cavitation threshold in water
N75-23915
A man-machine procedure for extracting information from data collected by the Earth Resources Technology Satellite
[PB-238431/1] N75-24073
Spectral analysis of the energy exchange at OWS NOVEMBER
[AD-A007484] N75-24286

SPEECH RECOGNITION
Complex waveform phonetic speech synthesis
N75-23814
SPHERICAL SHELLS
On the effect of a pressure wave on a spherical shell
N75-24036
SPHEROIDS
Spheroidization of normal and deuterated polyethylene --- laser applications
[SAND-74-0318] N75-23996
SPIN REDUCTION
A dry lubrication system for spaceproofed bearings --- Helios despin drives
N75-24008
SPINE
Spinal effects of an electrical vestibular stimulation in man
[NASA-TT-F-16314] N75-24318
SPIRAL GALAXIES
Nuclei and H2 regions in spiral galaxies: Preliminary results for M 101
N75-24575
SPOILERS
Effectiveness of spoilers on the GA[W]-1 airfoil with a high performance Fowler flap
[NASA-CR-2538] N75-23484
SPRAYED COATINGS
Determination of thermal properties of layer composites by flash method
[PB-239114/2] N75-23718
SPRINGS [ELASTIC]
The influence of short springs on longitudinal static stability
[CRANFIELD-AERO-29] N75-23607
SPUTTERING
Morphological growth of sputtered MoS2 films
[NASA-TM-X-71742] N75-24507
STABILITY
Development of high stability fuel
[AD-A007574] N75-23604
Methods for computing and modifying the LDV factors of a matrix
[NPL-NAC-56] N75-24421
STABILITY TESTS
Static, vibration, and stability analyses of anisotropic plates
N75-24020
STAGE SEPARATION
Abort separation study of a shuttle orbiter and external tank at hypersonic speeds
[NASA-TM-X-3212] N75-23651
STAGNATION PRESSURE
Effects of geometric variables on the performance of a probe for direct measurement of free-steam stagnation pressure in supersonic flow
[NASA-TN-D-7887] N75-23470
STAINLESS STEELS
Structure and properties of steels theromomechanically processed by impact extrusion
[AEC-IS-T-652] N75-23746
Corrosion fatigue of type 304 stainless steel in H2SO4 + NaCl at 25 C
N75-23748
Effect of neutron irradiation on the microstructure and properties of titanium-stabilized type 316 stainless steels
[ORNL-TM-4731] N75-23973
STANDARDS
Standard reference materials: The role of SRM's in measurement systems --- in nuclear engineering and chemistry
[COM-75-50070/2] N75-23941
STANDING WAVES
Some results of the hydrodynamic theory of finite-amplitude waves
N75-24275
STANNATES
Research on cadmium stannate selective optical films for solar energy applications
[PB-239372/6] N75-24159
STAR DISTRIBUTION
Galactic structure at l 2 equals 40 deg --- noting OB star distribution due to occultation by galactic dust
[SBN-902553-11-9] N75-24609
STARS
Star formation and contraction/fragmentation problems
N75-24583
STATIC ELECTRICITY
Influence of a strong static electrical field on the absorption spectrum of mylar polyester
[AD-A007864] N75-23795
STATIC LOADS
Centaur Standard Shroud [CSS] static limit load structural tests
[NASA-TM-X-71727] N75-23669
STATIC TESTS
Static, vibration, and stability analyses of anisotropic plates
N75-24020
STATIC THRUST
Improvement of propeller static thrust estimation
[NASA-CR-132680] N75-23567
STATISTICAL ANALYSIS
A stochastic rainfall model and statistical analysis of hydrologic factors
[PB-238948/4] N75-24238
Problems of space biology. Volume 26: Statistical analysis of the cardiac rhythm and hemodynamic indices in physiological research
[NASA-TT-F-16196] N75-24324
On the statistical theory of the propagation and scattering of light in simple fluids
N75-24460
STATISTICS
Statistical abstract of the United States, 1974
[COM-74-51149/4] N75-24524
STEADY FLOW
Steady incompressible potential flow around lifting bodies immersed in a fluid
[NASA-CR-142817] N75-23886
Transient operation of a steady state burner --- continuous flow combustion for low pollution automobile engines
N75-24095
STEADY STATE
Controllability of a steady-state Tokamak fusion reactor
[CONF-741086-9] N75-24453
The flux of particle loss in a permeable plasma
[TRITA-EPP-74-20] N75-24483
STEAM
The direct production of hydrocarbons from coal-steam systems
[PB-239356/9] N75-23740
STEELS
Determination of the shape, size, and orientation of defects by ultrasonic tests
N75-23749
Fracture toughness of bridge steels, phase 2 report
[PB-239188/6] N75-23774
Critical potentials for stress corrosion cracking [mechanism of stress corrosion cracking] --- steeling ammonium carbonate solutions
[AD-A007273] N75-23778
Metallurgical aspects of scuffing --- strain hardening and steels
N75-23995
Efficiency of steel fragments on thin duralumin targets
[ISL-12/74] N75-24009
On an approximate yield criterion for thin steel shells
[PB-239166/2] N75-24040
The impact of energy shortages on the iron and steel industries
[PB-238749/6] N75-24158
STEERING
A steering law for three double-gimbal control moment gyro systems
[NASA-TM-X-64926] N75-23925
STELLAR ENVELOPES
Radiative transfer in spherical circumstellar dust envelopes
N75-24603
STELLAR EVOLUTION
Star formation and contraction/fragmentation problems
N75-24583
STELLAR LUMINOSITY
Galactic structure at l 2 equals 40 deg --- noting OB star distribution due to occultation by galactic dust
[SBN-902553-11-9] N75-24609
STELLAR RADIATION
Infrared radiation model for the galactic centre --- interstellar dust heated by stellar radiation
N75-24587
STELLAR SPECTRA
NGC 7635 and its stellar nucleus --- emphasizing infrared data
N75-24558
Spectral variability of Cyg X-3 --- X ray sources
[NASA-TM-X-70891] N75-24595
A table of semiempirical gf values. Part 1: Wavelengths: 5.2682 nm to 272.3380 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142879] N75-24599
A table of semiempirical gf values. Part 2: Wavelengths: 272.3395 nm to 599.3892 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142880] N75-24600
A table of semiempirical gf values. Part 3: Wavelengths: 599.4004 nm to 9997.2746 nm --- to calculate line-blanketed model atmospheres for solar and stellar spectra
[NASA-CR-142881] N75-24601
Theoretical emission line profiles for Novae
N75-24602
STEREOPHOTOGRAPHY
Holographic stereogram conversion program
[AD-A007786] N75-23952
Investigation of the analytical stereoplotter AP/C [OP/C phase] in application to highway engineering projects
[PB-238461/8] N75-24091
STERILIZATION
Hot air sterilization
[NASA-TT-F-16384] N75-24320
STIFFNESS MATRIX
A finite element analysis of bodies of revolution. A comparison between currently used types of elements
[CRIF-MT-102] N75-24422
STILBENE
Holographic recording materials development --- using stilbene, indigo, and thioindigo derivatives
[NASA-CR-132672] N75-23930
STOCHASTIC PROCESSES
A stochastic snow model --- using Poisson process
N75-24227
STORAGE RINGS [PARTICLE ACCELERATORS]
Proceedings of the 9th International Conference on High Energy Accelerators
[CONF-740522] N75-24448
STORMS [METEOROLOGY]
Variational optimization analysis of temperature and moisture advection in a severe storm enviroament
[NASA-CR-141794] N75-24228
STRAIN ENERGY METHODS
Strain energy on disk shaped GP zone --- in age hardening alloys
[LBL-3174] N75-23766
STRAIN GAGES
Thermal strain determination using gages imbedded in plastic material mock-ups under time-dependent temperature variations
N75-23918
Optical strain recording, analysis of strain histories in structures
[AD-A007829] N75-23948
STRAIN HARDENING
Strain energy on disk shaped GP zone --- in age hardening alloys
[LBL-3174] N75-23766
Metallurgical aspects of scuffing --- strain hardening and steels
N75-23995
STRATIFICATION
Electron photon interactions in semiconductors
N75-24465
STRATIFIED FLOW
Temperature waves in a stratified sea
N75-24277
STRESS [PHYSIOLOGY]
Shallow Habitat Air Dive series [SHAD 1 and 2]: The effects on visual performance and physiology
[AD-A007104] N75-24342
Prediction of physiological respones to work, environment and clothing
[AD-A007282] N75-24348
STRESS ANALYSIS
Stress and strength analysis of reinforced plastic with holes. Consequences on design
N75-23705
Optical methods for testing composite materials --- stress analysis and fracture mechanics
N75-23707
Molecular mechanics of polymers by dynamic infrared techniques
N75-23786
Optical strain recording, analysis of strain histories in structures
[AD-A007829] N75-23948
A survey of the development of thermo-viscoelastic stress analysis --- polymers
[AD-A007561] N75-24045
STRESS CONCENTRATION
Combined stress effects upon failure of fiber composites --- carbon fiber reinforced plastics and boron reinforced materials
[AD-A007352] N75-23716
Residual stresses in notches produced by variable operational loads and their importance for the application of the linear cumulative damage hypothesis
[RAE-LIB-TRANS-1800] N75-24033
Stress concentration in an expanded plate with opening reinforced by central belt
[AD-A007672] N75-24044
STRESS CORROSION
Investigation of smooth specimen scc test procedures; variations in environment, specimen size, stressing frame, and stress state --- for high strength aluminum alloys
[NASA-CR-120752] N75-23758
Critical potentials for stress corrosion cracking [mechanism of stress corrosion cracking] --- steeling ammonium carbonate solutions
[AD-A007273] N75-23778
STRESS MEASUREMENT
Performance improvement of aluminum and titanium based alloys by new tempering methods for cooling acceleration and reduction of residual stresses
N75-24029
STRESS-STRAIN-TIME RELATIONS
Thermal strain determination using gages imbedded in plastic material mock-ups under time-dependent temperature variations
N75-23918

STRESSES
Determination of the stress-optic coefficients of Zn Se
[AD-A007778] N75-24467
STRIATION
The innervation of chick striated muscle fibres by the chick ciliary ganglion in tissue culture
[MBL-1974-33] N75-24338
STRIP TRANSMISSION LINES
Laboratory and flight results of the microstrip plasma probe --- blackout [propagation] and plasma sheaths
[AD-A007685] N75-23947
STRONTIUM
Water hyacinths and alligator weeds for removal of silver, cobalt, and strontium from polluted waters
[NASA-TM-X-72727] N75-24163
STRONTIUM FLUORIDES
Strontium fluoride compatibility program --- non-radioactive materials
[BNWL-1845-1] N75-23729
Research on Sr heat source and compatibility tests, dissolution rate, and property measurements of SrF2
[BNWL-1845-3] N75-24454
Casting of halide and flouride alloys for laser windows
[AD-A007656] N75-24468
STRONTIUM 90
Research on Sr heat source and compatibility tests, dissolution rate, and property measurements of SrF2
[BNWL-1845-3] N75-24454
STRUCTURAL ANALYSIS
A probabilistic analysis of structural reliability against fatigue and fracture
N75-24021
Study of the modifications needed for efficient operation of NASTRAN on the Control Data Corporation STAR-100 computer
[NASA-CR-132644] N75-24382
STRUCTURAL DESIGN
Specialists meeting on Failure Modes of Composite Materials with Organic Matrices and Their Consequences on Design
[AGARD-CP-163] N75-23698
Stress and strength analysis of reinforced plastic with holes. Consequences on design
N75-23705
Design of composite structure with respect to avoid crack propagation
N75-23709
Consideration of failure modes in the design of composite structures
N75-23710
Fabrication of experimental three-meter space telescope primary and secondary mirror support structure
[NASA-CR-143796] N75-23986
An interdisciplinary engineering approach to a facility design study with emphasis on energy conservation. Volume 2: Main report text
[AD-A006804] N75-24129
STRUCTURAL STABILITY
Elevated temperature morphological stability of metal matrix fiber composites
[ORO-3947-11] N75-23712
STRUCTURAL STRAIN
Centaur Standard Shroud [CSS] static limit load structural tests
[NASA-TM-X-71727] N75-23669
STRUTS
Experimental study of model size effects on cavitation and ventilation of surface piercing struts --- hydrofoil craft
[AD-A006672] N75-23896
SUBMARINES
Center for Technical Submarine Studies and Research
[NASA-TT-F-16385] N75-24361
SUBMILLIMETER WAVES
Astronomy at sub-millimeter wavelengths --- using telescopes mounted on gondolas
[NASA-CR-142814] N75-23927
One millimeter observations of H2 regions --- to establish mean spectral index in submillimeter region
N75-24568
SUBSONIC FLOW
A finite-element method for lifting surfaces in steady incompressible subsonic flow
[NASA-CR-142811] N75-23477
Subsonic base and boattail drag, an analytical approach
N75-23492
SUBSONIC SPEED
Subsonic and supersonic indicial aerodynamics and aerodynamic transfer function for complex configurations --- aerodynamic configurations for subsonic and supersonic speeds using the finite element method
[NASA-CR-142818] N75-23478
The subsonic base drag of cylindrical twin-jet and single-jet afterbodies
N75-23498
Effect of wing planform and canard location and geometry on the longitudinal aerodynamic characteristics of a close-coupled canard wing model at subsonic speeds
[NASA-TN-D-7910] N75-23514
SULFATES
Sodium sulfate: Vaporization thermodynamics and role in corrosive flames
[NASA-TM-X-71641] N75-23752
SULFUR
Ion implantation of diatomic sulfur into GaAs
[AD-A006801] N75-24514
SULFUR OXIDES
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, May 1973
N75-24165
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, Jun. 1973
N75-24166
SUPERCONDUCTING MAGNETS
Initial operation of Siemens superconducting prototype magnet W VII at the Plasma Physics Institute
[NASA-TT-F-16291] N75-24479
SUPERCONDUCTIVITY
A chemical bond approach to metals and alloys
N75-23744
Magnetic torque on a rotating superconducting sphere
[NASA-TR-R-443] N75-24502
Critical current density in superconducting niobium films
[CONF-740957-21] N75-24509
Effect of metallurgical history on Jc[5T] in surface diffused multifilamentary Nb3Sn
[BNL-19271] N75-24511
Electronic tunneling and structure of superconducting niobium single crystals
[AD-A007580] N75-24515
SUPERCONDUCTORS
Study of very pure metals at low temperature
[ORO-3665-44] N75-23764
Effect of the quasiparticle-pair interference current on thermal fluctuations in weakly coupled superconductors and on the operation of RF-biased SQUIDS
N75-24494
SUPERGIANT STARS
Copernicus observations of Betelgeuse and Antares
[NASA-CR-142815] N75-24598
SUPERHIGH FREQUENCIES
Controllable liquid artificial dielectric S-band phase shifters
[AD-A007785] N75-23868
Refractometric measurements in the Lacq area
N75-24206
New observations of H2 regions at 7.875, 15.5, 31.4, or 85 GHz
N75-24569
High-resolution radio observations of the sources near K3-50
N75-24570
SUPERNOVAE
The use of supernovae light curves for testing the expansion hypothesis and other cosmological relations
N75-24592
SUPERSONIC AIRCRAFT
An air intake control system for a supersonic fighter aircraft
N75-23589
SUPERSONIC BOUNDARY LAYERS
Supersonic laminar boundary layer flow past a wavy wall with multiple separation regions
[AD-A007433] N75-23905
SUPERSONIC COMBUSTION RAMJET ENGINES
Subscale, hydrogen-burning, airframe-integrated-scramjet: Experimental and theoretical evaluation of a water cooled strut airframe-integrated-scramjet: Experimental leading edge
[NASA-TM-X-72682] N75-23885
SUPERSONIC FLIGHT
Design and analysis of a supersonic penetration/maneuvering fighter
[NASA-CR-132633] N75-23558
SUPERSONIC FLOW
Effects of geometric variables on the performance of a probe for direct measurement of free-steam stagnation pressure in supersonic flow
[NASA-TN-D-7887] N75-23470
An experimental investigation of the component drag composition of a two-dimensional inlet at transonic and supersonic speeds
N75-23489
Interaction of shock wave with wedge, which moves at supersonic speed
[AD-A007302] N75-23519
Experimental study of heat transfer during flow around uncambered delta wings with blunted edges
[AD-A007316] N75-23524
A finite element formulation for supersonic flows around complex configurations
[NASA-CR-142819] N75-23887
Flows with lambda-shaped shocks at the entrance into plane supersonic air inlet
[AD-A007458] N75-23907
HF/DF chemical laser performance modification by chemical additives --- supersonic flow
[AD-A007263] N75-23976
SUPERSONIC INLETS
Transonic off-design drag and performance of three mixed-compression axisymmetric inlets
[NASA-TM-X-3215] N75-23602
Flows with lambda-shaped shocks at the entrance into plane supersonic air inlet
[AD-A007458] N75-23907
SUPERSONIC NOZZLES
Effect of external conditions on the functioning of a dual flow supersonic nozzle --- designing propulsion system of military aircraft
N75-23491
SUPERSONIC SPEEDS
Abort separation study of a shuttle orbiter and external tank at hypersonic speeds
[NASA-TM-X-3212] N75-23651
SUPERSONIC WIND TUNNELS
Development of holographic interferometric applications in the VKF supersonic and hypersonic wind tunnels
[AD-A007689] N75-23615
SUPERSONICS
Subsonic and supersonic indicial aerodynamics and aerodynamic transfer function for complex configurations --- aerodynamic configurations for subsonic and supersonic speeds using the finite element method
[NASA-CR-142818] N75-23478
SURFACE DEFECTS
Fracture and fatigue crack growth behavior of surface flaws and flaws originating at fastener holes. Volume 2: Tabulated data
[AD-A003416] N75-23776
SURFACE DIFFUSION
Effect of metallurgical history on Jc[5T] in surface diffused multifilamentary Nb3Sn
[BNL-19271] N75-24511
SURFACE ENERGY
Flame spreading on horizontal and vertical fuel surfaces --- flame propagation fuel flow burning rate and surface energy of thermoplastic resins
N75-23723
SURFACE FINISHING
Surface finishing --- particularly for use in smoothing irregularities on aluminum aircraft wings
[NASA-CASE-MSC-12631-1] N75-23476
Possible applications of surface treatment to ultrahigh vacuum friction for space utilization
N75-23626
Production engineering measure for high range Geiger Mueller tube --- using surface finishing
[AD-A007258] N75-23944
Effect of longitudinal surface finish on elastohydrodynamic lubrication
[NASA-TN-D-7967] N75-23990
Laser window surface finishing and coating technology
[AD-A007791] N75-24466
Effect of surface metallurgy on the penetration depth and RF breakdown field of superconducting niobium
[BNL-19276] N75-24512
SURFACE LAYERS
Lubrication breakdown under boundary conditions --- sliding friction and a failure analysis
N75-23993
Fast and easy production of monolayer plaque assay slides
[MBL-1974-31] N75-24336
SURFACE PROPERTIES
Surface studies of cobalt alloys in ultra high vacuum utilizing contact resistance
N75-23745
SURFACE REACTIONS
A study of glow discharge polymerization as a means of modifying the surface of polymers
[PB-239289/2] N75-23797
SURFACE ROUGHNESS
Investigation of contact between ground surfaces through continuous time series model
N75-24027
SURFACE STABILITY
Strength degradation of brittle surfaces: Blunt indenters --- for ceramic materials
[AD-A007447] N75-23793
Application of the MOS-C-V technique to determine impurity concentrations and surface parameters on the diffused face of silicon solar cells
[NASA-TM-X-71721] N75-24505
SURFACE TEMPERATURE
Radiative transfer between surfaces with spectral, directional, and temperature dependent properties --- radiative heat transfer of tungsten by collimated solar flux
N75-23873
SURFACE TO AIR MISSILES
Report of the Army Scientific Advisory Pannel ad hoc group on White Sands Missile Range instrumentation
[AD-A007836] N75-23643

SURFACE WATER
Utilization of Skylab EREP system for appraising changes in continental migratory bird habitat --- using multispectral band scanner
[E75-10281] N75-24054
The role of large-scale atmospheric circulation in the formation of temperature anomalies in surface waters as illustrated by the northern part of the Pacific Ocean
N75-24266

SURFACE WAVES
Proceedings of the Canadian Workshop on acoustic surface waves --- signal processing and wave propagation
[CRC-R-1260] N75-23821
Wave height indicators
[COM-75-10140/2] N75-24289

SURFACES
A finite-element method for lifting surfaces in steady incompressible subsonic flow
[NASA-CR-142811] N75-23477

SWEDEN
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Jul. - Sep. 1974
[REPT-74/7-9] N75-24214
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Oct. - Dec. 1974
[REPT-74/10-12] N75-24215

SWEEP FREQUENCY
Linearization of FM-CW radar sweep by feedback
[AD-A007867] N75-23551
Ray-tracing simulation of swept-frequency backscatter ionograms
[AD-A007686] N75-23832

SWEPT WINGS
Velocity and rolling-moment measurements in the wake of a swept-wing model in the 40 by 80 foot wind tunnel
[NASA-TM-X-62414] N75-23481

SWEPTBACK WINGS
Calculation of loads and deformations of sweptback wing with the aid of mechanical analog instruments
[AD-A007308] N75-23525

SWITCHING THEORY
Tactical communication systems --- signal processing and switching theory
[AD-A007260] N75-23833
Thermal mechanism of the switching effect in oxidized vanadium
N75-24508

SYMBOLIC PROGRAMMING
APS-73 cross assembler reference manual --- symbolic programming
[PB-238821/3] N75-24403

SYNAPSES
The innervation of chick striated muscle fibres by the chick ciliary ganglion in tissue culture
[MBL-1974-33] N75-24338

SYNCHRONISM
The design of multiple-valued asynchronous sequential circuits
N75-23846

SYNCHRONOUS SATELLITES
Results of the 3 November 1974 Applications Technology Satellite-6 [ATS-6] trilateration test
[NASA-TM-X-70897] N75-23656

SYNOPTIC METEOROLOGY
Summary of synoptic meteorological observations Caribbean and nearby island coastal marine areas. Volume 2: Area 7 - Cayman, area 8 - Jamaica west, area 9 - Jamaica south, area 10 - Jamaica north, area 11 - Jamaica south-east
[AD-A001031] N75-24235
Summary of synoptic meteorological observations. North American coastal marine areas, revised. Atlantic and Gulf Coasts. Volume 1. Revised. Area 1: Belle Isle Strait. Area 2: Osv Bravo. Area 3: NE Newfoundland coast. Area 4: SE Newfoundland coast. Area 5: Placentia Bay south. Area 6: Cabot Strait. Area 7: Anticosti Island
[AD-A006990] N75-24237
Summary of synoptic meteorological observations. Indonesian coastal marine areas, volume 1. Area 1: Southeast Sumatra. Area 2: Christmas Island. Area 3: Sunda Strait. Area 4: Northeast Java Sea. Area 5: Bangka Island northeast. Area 6: Natuna Island. Area 7: Sarawak
[AD-A006923] N75-24242
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 3: Area 12, Hispaniola South; area 13, Windward Passage; area 14, Grand Bahama; area 15, Nassau; area 16, San Salvador; area 17, Acklins Island
[AD-A001912] N75-24244
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 5: Area 24, Virgin Islands; area 25, Leeward Islands; area 26, Winward Islands; area 27, Trinidad; area 28, Barcelona; area 29, Caracas
[AD-A001918] N75-24245
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 6: Area 30, Gulf of Venezuela, area 31, Riohacha; area 32, Cartagena; area 33, Colon; area 34, Gulf of Panama; area 35, Galapagos islands
[AD-A001973] N75-24246

SYNTHETIC ARRAYS
The effects of aberrations in synthetic aperture systems --- using optical transfer function, imaging techniques, and photographic equipment
[AD-A007774] N75-23954
The effects of abberrations in synthetic aperture systems
N75-24463

SYSTEMS ANALYSIS
Construction of a dynamic airport system
[TT-7408] N75-23612
Load and frequency control for interconnected power systems
[PB-239278/5] N75-23857
Electric power systems analysis research
[PB-239236/3] N75-24139
Applied systems ecology: Models, data, and statistical methods
[BNWL-SA-5216] N75-24425

SYSTEMS ENGINEERING
An overview and assessment of plans and programs for the development of the upgraded third generation air traffic control system
[AD-A008940] N75-23531
Evolution of turboreactor control systems
N75-23588
The use of digital control for complex power plant management
N75-23596
An automated approach to some basic sample handling concepts
N75-23721
A preliminary design of a TDMA system for FLEETSAT
[AD-A007823] N75-23829
The development of a solar residential heating and cooling system
[NASA-CR-142728] N75-24107
Vulnerability of natural gas systems --- industrial management and operations
[AD-A007583] N75-24143
Setup of administrative computer service described
N75-24659

SYSTEMS MANAGEMENT
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 1: Summary report --- systems management evaluation and design analysis
[NASA-TM-X-66814] N75-23644
Report to the administrator by the NASA Aerospace Safety Advisory Panel on the Skylab program. Volume 2: Program implementation and maturity --- systems management evaluation and design analysis
[NASA-TM-X-66815] N75-23645

SYSTEMS STABILITY
Plasma equilibrium in external ring systems
[TRITA-EPP-74-23] N75-24486

T

T-33 AIRCRAFT
Analysis of wake vortex flight test data behind a T-33 aircraft
[NASA-CR-137669] N75-23482

TABLES [DATA]
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, May 1973
N75-24165
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages --- from Belgian weather stations, Jun. 1973
N75-24166

TAIL ASSEMBLIES
Subsonic base and boattail drag, an analytical approach
N75-23492

TANTALUM
Field ion microscopic study of films of molybdenum, platinum and tantalum vapor deposited on tungsten
N75-23747

TARGET ACQUISITION
Real time display parameters study 2
[AD-A007790] N75-24367

TARGET DRONE AIRCRAFT
On the statistical analysis of the radar signature of the MQM-34D
[AD-A007765] N75-23552

TARGET RECOGNITION
Passive ranging with wavefront sampling
[AD-A007387] N75-23836
Image-storage tube for space applications. Development of the SEC target --- methods to assess target resolution, target stabilization
[ESRO-CR-212] N75-23938

TECHNOLOGY ASSESSMENT
Report of the Army Scientific Advisory Pannel ad hoc group on White Sands Missile Range instrumentation
[AD-A007836] N75-23643
A preliminary technology assessment of ocean thermal gradient energy generation
[PB-238646/4] N75-24147
Performance improvement of a field effect transistor with Schottky barrier on GaAs
[MB/DL-CRL-32/43] N75-24500

TECHNOLOGY TRANSFER
Passive Radar --- technology transfer
[AD-A007438] N75-23830
New technologies in metallurgy studied by Research Institute
N75-24656

TECHNOLOGY UTILIZATION
Automation trends --- technology utilization of digital computers for production planning in chemical engineering
[UCRL-75320] N75-23728

TECTONICS
Fault tectonics and earthquake hazards in the Peninsular Ranges, Southern California --- Mojave Desert
[E75-10284] N75-24057
Identification and interpretation of tectonic features from Skylab imagery --- Mojave Desert and San Bernardino Mountains, California
[E75-10288] N75-24061
A method for the estimation of the parameters of a gamma distribution --- stochastic model for tectonic features
[PB-238844/5] N75-24077

TELECOMMUNICATION
Communications experimenter's guide. Communications technology satellite
[CRC-TN-671[CS-03-01]] N75-23655
Electromagnetic noise in McElroy Mine
[COM-74-11717/7] N75-23826
Tactical communication systems --- signal processing and switching theory
[AD-A007260] N75-23833
Solid state amplifier for spread spectrum communications
[AD-A007789] N75-23858
World Weather Watch: Seventh status report on implementation
[WMO-401] N75-24234
Data processor sizing for an Aeronautical Satellite Communications Center [ASCC]
[AD-A007624] N75-24408
Description of computer network analysis model --- used computerized simulation
[AD-A007417] N75-24410

TELEMETRY
LANDSAT-2 launch and flight activation. Launch through orbit 50 and orbit adjust operation --- telemetry data processing
[NASA-CR-143744] N75-23630

TELESCOPES
Fabrication of experimental three-meter space telescope primary and secondary mirror support structure
[NASA-CR-143796] N75-23986

TELEVISION CAMERAS
Instrumentation and some results of photographic study on board the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16342] N75-24623

TELEVISION RECEPTION
Specification of the timing stabilities of broadcast monochrome and PAL colour television signals
[BBC-RD-1975/14] N75-23818

TELLURIUM COMPOUNDS
Applied research on 2 - 6 compound materials for heterojunction solar cells
[PB-239184/5] N75-24146

TEMPERATURE CONTROL
Hydrostatic fluid bearing gyro --- temperature control
[NASA-CR-120753] N75-23931
Phase 1 engineering and technical data report for the thermal control extravehicular life support system
[NASA-CR-141793] N75-24360

TEMPERATURE DISTRIBUTION
Performance improvement of aluminum and titanium based alloys by new tempering methods for cooling acceleration and reduction of residual stresses
N75-24029
Satellite infrared soundings from NOAA spacecraft --- to measure temperature and humidity
[COM-75-10256/6] N75-24260
Temperature fields of an absorptive medium in a radiating system of arbitrary configuration [the spatial problem]
N75-24271
Calculation of the radiative heat exchange in a conical cavity of complex configuration with an absorptive medium
N75-24272
Temperature waves in a stratified sea
N75-24277

TEMPERATURE EFFECTS
Exhaust plume temperature effects on nozzle afterbody performance over the transonic Mach number range
N75-23504
Temperature dependence of particulate erosion --- tungsten and zirconium carbides
[AD-A007841] N75-24459
TEMPERATURE GRADIENTS
Observations of short period internal waves generated by shear flow instability --- temperature gradients
N75-23871
A digital computer simulation of the annual snow and soil thermal regimes at Barrow, Alaska
[AD-A007734] N75-24082
Temperature field and heat flow in snow cover
[TT-71-51011] N75-24086
TEMPERATURE INVERSIONS
An indirect method for measuring surface based temperature inversions --- air pollution monitoring
[AD-A067872] N75-23950
Some characteristics of Hawaiian high intensity rainfall
[PB-239398/1] N75-24261
TEMPERATURE MEASUREMENT
Spring and fall thermal bar development in Lake Superior
[PB-239227/2] N75-24184
TEMPERATURE MEASURING INSTRUMENTS
Temperature measurement for advanced gas turbine controls
N75-23597
TEMPERING
Performance improvement of aluminum and titanium based alloys by new tempering methods for cooling acceleration and reduction of residual stresses
N75-24029
TERMINAL FACILITIES
The airport/urban interface
[PB-238914/6] N75-23618
TERNARY ALLOYS
Thermodynamic properties and phase diagram of ternary sodium alloys. 1: The system sodium plus cadmium plus indium
[PEL-230] N75-23730
TERRAIN ANALYSIS
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-1] N75-24064
The application of airborne imaging radars [L and X-band] to earth resources problems
[NASA-CR-139385-2] N75-24065
Investigation of multispectral techniques for remotely identifying terrain features and natural materials
[PB-238675/3] N75-24078
Field studies and remote sensing along the Natal Coast, South Africa
[AD-A007285] N75-24084
Martian obliterational history
N75-24610
TERRESTRIAL RADIATION
Earth radiation budget measurement from a spinning satellite: Conceptual design of detectors
[NASA-CR-132494] N75-23920
TEST FACILITIES
A testrig to measure the thermal conductance and friction torque of bearings in vacuum
N75-24001
Computer controlled data acquisition system for the high temperature sodium test facility
[HEDL-TME-74-60] N75-24533
TEXAS
Irrigation scheduling, freeze warning and soil salinity detecting --- in Cameron County Texas
[E75-10285] N75-24058
THEMATIC MAPPING
Preliminary analysis of the Beaver Creek and Ninemile Hill areas, Wind River Basin, Wyoming using image ratios and thematic classification
[E75-10287] N75-24060
THEOREM PROVING
Automatic program verification 3: A methodology for verifying programs --- proving and checkout
[AD-A007563] N75-24398
THEORETICAL PHYSICS
Translations on eastern Europe: Scientific affairs, no. 464 --- metal working, theoretical physics, computer techniques
[JPRS-64751] N75-24655
Achievements and tasks of solid-state research in Hungary
N75-24658
THERAPY
An alternative therapy against organophosphate poisoning
[MBL-1974-32] N75-24337
THERMAL CONDUCTIVITY
Thermophysical properties of matter and substances, Volume 2 --- thermal conductivity, critical temperature, critical point, specific heat, and thermal expansion
[TT-72-52001-VOL-2] N75-23738
A testrig to measure the thermal conductance and friction torque of bearings in vacuum
N75-24001
Drift current in a thin surface layer of the ocean
N75-24265
A study of the physical properties and bistable conduction characteristics of amorphous bismuth thioxide thin films
N75-24493
THERMAL EMISSION
Recent observations of the 8-13 micron spectra of H2 regions
N75-24562
THERMAL EXPANSION
Thermophysical properties of matter and substances, Volume 2 --- thermal conductivity, critical temperature, critical point, specific heat, and thermal expansion
[TT-72-52001-VOL-2] N75-23738
THERMAL FATIGUE
Effects of silicon additions on oxidation and mechanical behavior of the nickel-base superalloy B-1900
[NASA-TN-D-7989] N75-23761
THERMAL INSTABILITY
Effect of the quasiparticle-pair interference current on thermal fluctuations in weakly coupled superconductors and on the operation of RF-biased SQUIDS
N75-24494
Thermal mechanism of the switching effect in oxidized vanadium
N75-24508
THERMAL NEUTRONS
Thermal neutron filter cadmium electroplate properties
[ANCR-1189] N75-23711
THERMAL POLLUTION
An experimental study of the surface effect on a bouyant jet
[PB-239536/6] N75-23897
Spring and fall thermal bar development in Lake Superior
[PB-239227/2] N75-24184
THERMAL PROTECTION
A users manual for a revised version of the Langley charring ablator program
[NASA-TM-X-72677] N75-23881
THERMAL RADIATION
Passive Radar
[AD-A007651] N75-23828
THERMAL STRESSES
Analysis of thermal stresses and metal movement during welding
[NASA-CR-120757] N75-23754
Thermal strain determination using gages imbedded in plastic material mock-ups under time-dependent temperature variations
N75-23918
Thermal loading in the laser holography nondestructive testing of a composite structure
[NASA-TR-R-439] N75-24035
THERMODYNAMIC PROPERTIES
The use of carbon fibre reinforced plastics in satellite structures. Volume 1: Summary
[HSD-TP-7509-VOL-1-SUMM] N75-23713
Determination of thermal properties of layer composites by flash method
[PB-239114/2] N75-23718
Thermodynamic properties and phase diagram of ternary sodium alloys. 1: The system sodium plus cadmium plus indium
[PEL-230] N75-23730
THERMODYNAMICS
Structure and properties of steels theromomechanically processed by impact extrusion
[AEC-IS-T-652] N75-23746
Thermodynamics of liquid metal MHD converters
[AD-A007415] N75-24141
THERMOELECTRICITY
Thermoelectric properties of ceramic refractory semiconductors
[AD-A007862] N75-24519
THERMONUCLEAR POWER GENERATION
Proceedings of 5th annual symposium: Energy Research and Development --- solar energy, windpower utilization, thermonuclear power generation
[AD-A007799] N75-24142
THERMOPLASTIC RESINS
Flame spreading on horizontal and vertical fuel surfaces --- flame propagation fuel flow burning rate and surface energy of thermoplastic resins
N75-23723
THERMOPLASTICITY
Study of fiber reinforcement of thermoplastic polymers
N75-23695
THERMOREGULATION
Prediction of physiological respones to work, environment and clothing
[AD-A007282] N75-24348
THERMOVISCOELASTICITY
A survey of the development of thermo-viscoelastic stress analysis --- polymers
[AD-A007561] N75-24045
THICKNESS
The criterion for optimum character for the selection of the thicknesses of plates which are located under the action of bending load
[AD-A007455] N75-24046
THICKNESS RATIO
Method of the optimization of the load-carrying structure of wing on rigidity during variation by the distribution of thickness ratio
[AD-A007317] N75-23521
THIN FILMS
Symposium on the Material Science Aspects of Thin Film Systems for Solar Energy Conversion
[PB-239270/2] N75-24150
A study of the physical properties and bistable conduction characteristics of amorphous bismuth thioxide thin films
N75-24493
Digital film and precipitation meter, and oil pollution metering device
N75-24657
THIN PLATES
Determination of transverse weld yield strength on thin plate
[AMSR.0039.74] N75-24039
THIN WALLED SHELLS
A finite element displacement approach for the elasto-plastic analysis of thin cylindrical shells
N75-24023
On an approximate yield criterion for thin steel shells
[PB-239166/2] N75-24040
THORIUM
Assessment of uranium and thorium resources in the United States and the effect of policy alternatives
[PB-238658/9] N75-24133
THREE DIMENSIONAL FLOW
Development of a three-dimensional time-dependent flow field model
[NASA-CR-120762] N75-24070
Computational techniques for boundary layers
[SAND-74-5821] N75-24420
THREE DIMENSIONAL MOTION
Simulated snowdrift patterns: Evaluation of geometric modeling criteria for a three dimensional structure
[AD-A007735] N75-24050
THRESHOLDS [PERCEPTION]
Human temporary threshold shift and recovery from 24 hour acoustic exposures
[AD-A007842] N75-24350
THRUST
Contributions to the calculation of satellite transfer from near-earth to geostationary orbits by small thrust-acceleration in regularised variables
[ESRO-TT-138] N75-23638
THRUST PROGRAMMING
Study to document low thrust trajectory optimization programs HILTOP and ASTOP
[NASA-CR-120767] N75-23635
THRUST REVERSAL
Research about effects of external flow and aircraft installation conditions on thrust reversers performances
N75-23495
Reverse thrust experience on the concorde
N75-23496
Aerodynamic aspects and optimisation of thrust reverser systems
N75-23513
THUNDERSTORMS
A stochastic rainfall model and statistical analysis of hydrologic factors
[PB-238948/4] N75-24238
Updraft properties deduced from Rawinsoundings
[COM-75-10193/1] N75-24240
Mesonetwork array: Its effect on thunderstorm flow resolution --- wind
[COM-75-10248/3] N75-24257
THYRISTORS
Functioning of power rectifiers and thyristors from 1 January 1970 to 31 December 1972, noting carrier injection, emitter shorts, ignition, and breakdown
[NASA-TT-F-16365] N75-23850
TIDES
Tides and tidal currents of Narragansett Bay
[COM-75-10250/9] N75-24290
Variability of tidal datums and accuracy in determining datums from short series of observations
[COM-75-10275/6] N75-24291
TIME DEPENDENCE
Time dependent accretion disks around compact objects, part 1. Theoretical frameworks for analyzing and testing gravitation theories, part 2
N75-24604
TIME DIVISION MULTIPLEXING
A preliminary design of a TDMA system for FLEETSAT
[AD-A007823] N75-23829
TIME MEASUREMENT
Specification of the timing stabilities of broadcast monochrome and PAL colour television signals
[BBC-RD-1975/14] N75-23818

TIME SERIES ANALYSIS
Investigation of contact between ground surfaces through continuous time series model
N75-24027

TIME SHARING
Hardware-software interactions in SYMBOL-2R's operating system
[PB-239220/7] N75-24378
Load sharing in computer networks: A queueing model
N75-24424

TIRES
Hydroplaning and tread pattern hydrodynamics
[PB-239504/4] N75-24554

TITANIUM
The effect of grain size and retained austenite on the ductile-brittle transition of a titanium-gettered iron alloy
[AD-A007360] N75-23780

TITANIUM ALLOYS
Characteristics of HY-180 and Ti-100 for welded high strength structures
[AD-A006758] N75-23782
Performance improvement of aluminum and titanium based alloys by new tempering methods for cooling acceleration and reduction of residual stresses
N75-24029
Low temperature calorimetry of transition metal alloys --- alloys of ferromagnetic metals with titanium
N75-24492

TOKAMAK FUSION REACTORS
Controllability of a steady-state Tokamak fusion reactor
[CONF-741086-9] N75-24453

TOPOLOGY
The effects of topology on the properties of random network models for amorphous Group 4 semiconductors --- germanium, silicon, and energy bands
N75-24495

TOROIDAL PLASMAS
Plasma equilibria with closed magnetic field lines
N75-24474
Guiding center simulation of toroidal plasmas
[UCRL-51725] N75-24480

TOROIDS
A finite element analysis of bodies of revolution. A comparison between currently used types of elements
[CRIF-MT-102] N75-24422

TORQUE
On the effects of solid lubrication on the torque of a ball bearing --- D2B satellite
N75-24000

TORQUEMETERS
A testrig to measure the thermal conductance and friction torque of bearings in vacuum
N75-24001
Method for continuous torque measurement of dry miniature bearings --- using microbalance
N75-24006

TOXIC DISEASES
An alternative therapy against organophosphate poisoning
[MBL-1974-32] N75-24337

TOXIC HAZARDS
Smoke hazards from burning plastics
[UCRL-76015] N75-23809
Toxic substances alert program
[NASA-TM-X-71711] N75-24319

TOXICITY
Preliminary assessment of the environmental problems associated with vinyl chloride and polyvinyl chloride
[PB-239110/0] N75-24196

TRACE CONTAMINANTS
Bibliography on contaminants and solubility of organic compounds in oxygen
[NASA-TM-X-71700] N75-23688

TRACE ELEMENTS
Application of the radio frequency furnace technique to environmental trace analysis, part 1. The applicability of Hadamard Transform techniques to visible spectroscopy
N75-23722

TRACERS
Development of sampling devices for gaseous atmospheric tracers
[PB-238921/1] N75-23960

TRAJECTORY ANALYSIS
FORTRAN program for calculating the trajectory of projectiles
[NASA-TT-F-16316] N75-23634

TRAJECTORY CONTROL
Study to document low thrust trajectory optimization programs HILTOP and ASTOP
[NASA-CR-120767] N75-23635

TRAJECTORY OPTIMIZATION
Minimum-time rescue trajectories between spacecraft in circular orbits
N75-23628
Global optimality conditions and the Darboux point --- trajectory optimization
N75-24414

TRANSFER FUNCTIONS
The D sub m[kappa, alpha 1..., alpha sub m function in the ocean-continent transfer problem
N75-24269
Determining the parameters of the prognostic operator for undamped fluctuations by the use of the D sub m[kappa; alpha 1,..., alpha sub m]
N75-24270
The effects of abberrations in synthetic aperture systems
N75-24463

TRANSFER ORBITS
Contributions to the calculation of satellite transfer from near-earth to geostationary orbits by small thrust-acceleration in regularised variables
[ESRO-TT-138] N75-23638

TRANSFUSION
The cause of death resulting from transfusion resistant shock. Part 1: Influence of brain damage
[MBL-1975-1] N75-24330

TRANSIENT RESPONSE
Aerothermodynamic factors governing the response rate of gas turbines
N75-23576
Application of mode locked solid state lasers to photographic investigation of transient phenomena
N75-23806
A users manual for a revised version of the Langley charring ablator program
[NASA-TM-X-72677] N75-23881
Estimation of structural dynamic model parameters from transient response data
N75-24022
Microwave transient response measurements of elastic momentum transfer collision frequency
[ORO-3027-26] N75-24444

TRANSISTORS
Power transistor reliability investigation
[AD-A007587] N75-23862
Reliability study of microwave power transistors
[AD-A007788] N75-23863
Long term reliability investigations of the MSC-1330 microwave power transistor and the AMPAC 1214-30 internally matched device
[AD-A007354] N75-23866

TRANSIT TIME
Properties and potential of BARITT devices --- barrier injection transit time devices
N75-24491
The determination and evaluation of objective access times to public transit for disaggregate traveler behavior modeling
[PB-239212/4] N75-24551

TRANSITION METALS
A chemical bond approach to metals and alloys
N75-23744
Low temperature calorimetry of transition metal alloys --- alloys of ferromagnetic metals with titanium
N75-24492

TRANSLATING
Transcription of bacteriophage Mu: An analysis of the transcription pattern in the early phase of development
[MBL-1974-36] N75-24341

TRANSMISSION LINES
Electrotechnical handbook, volume 1, book 1, 4th edition revised selected parts 6 and 10
[AD-A003088] N75-23856

TRANSONIC FLIGHT
On some problems encountered in a theoretical study of the external flow over a nozzle configuration in transonic flight
N75-23499

TRANSONIC FLOW
The measurement of the transonic spillage drag of a supersonic intake
N75-23488
An experimental investigation of the component drag composition of a two-dimensional inlet at transonic and supersonic speeds
N75-23489
Unsteady behavior of transonic flows --- shock induced oscillation
[MPIS-MITT-59] N75-23516
Application of local linearization and the transonic equivalence rule to the flow about slender analytic bodies at Mach numbers near 1.0
[NASA-TM-X-72654] N75-23890

TRANSONIC SPEED
Low speed injection effects on the aerodynamic performance at transonic speed
N75-23494
Effect of canard position and wing leading-edge flap deflection on wing buffet at transonic speeds
[NASA-TM-X-72681] N75-23559
Transonic off-design drag and performance of three mixed-compression axisymmetric inlets
[NASA-TM-X-3215] N75-23602

TRANSONIC WIND TUNNELS
Some problems of modelling aeroelastic phenomena in a transonic tunnel
[AD-A007391] N75-23561
Comparison of flight measurements with predictions from aeroelastic models in the NASA Langley Transonic Dynamics Tunnel
[NASA-TM-X-72686] N75-23610
Noise generation in transonic wind tunnels
[AD-A007688] N75-23614
Results of transonic wind tunnel tests on an 0.010-scale space shuttle mated vehicle model 72-OTS in the LaRC 8-foot TPT [IA43]
[NASA-CR-141525] N75-23666

TRANSPONDERS
Results of the 3 November 1974 Applications Technology Satellite-6 [ATS-6] trilateration test
[NASA-TM-X-70897] N75-23656

TRANSPORT AIRCRAFT
High-capacity transport planes as modern air freight systems
[NASA-TT-F-16396] N75-23533

TRANSPORT PROPERTIES
Electrical transport properties in n GaSb under hydrostatic pressure
N75-24496

TRANSPORTATION
The determination and evaluation of objective access times to public transit for disaggregate traveler behavior modeling
[PB-239212/4] N75-24551

TRAPATT DEVICES
Solid state amplifier for spread spectrum communications
[AD-A007789] N75-23858

TRAPPED PARTICLES
Minority carrier kinetics in defect trap distributions in semiconductors: Application to trigonal selenium single crystals
N75-24497

TRAVEL
Highway travel forecasts
[PB-239169/6] N75-24549

TRAVELING WAVE MODULATION
Some methods of receiving polarization modulation signals, chapter 6
N75-23823

TREADS
Hydroplaning and tread pattern hydrodynamics
[PB-239504/4] N75-24554

TREES [PLANTS]
Multispectral aerial reconnaissance of parasitic attacks in forests: Remote sensing --- in France
N75-24052
The energy plantation
N75-24103

TROPICAL REGIONS
Coastal upwelling on the east of the tropical zone of the North Atlantic and its relation to the stability of the northeast tradewind
N75-24264

TROPICAL STORMS
SPLASH programs user's guide
[COM-75-10181/6] N75-24288

TRYPTOPHAN
Punctuation of transcription in vitro of the tryptophan operon of Escherichia coli. A novel type of control of transcription
[MBL-1975-4] N75-24311
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 2: Studies on the specificity of initiation of transcription
[MBL-1975-5] N75-24312
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 3: Evidence for positive control of transcription
[MBL-1975-6] N75-24313

TUNGSTEN
Investigation of hydrogen chemisorption on the tungsten [100] surface --- Auger spectroscopy
[AD-A007434] N75-23731
Field ion microscopic study of films of molybdenum, platinum and tantalum vapor deposited on tungsten
N75-23747
Radiative transfer between surfaces with spectral, directional, and temperature dependent properties --- radiative heat transfer of tungsten by collimated solar flux
N75-23873

TUNGSTEN CARBIDES
Temperature dependence of particulate erosion --- tungsten and zirconium carbides
[AD-A007841] N75-24459

TURBINE BLADES
Experimental transient turbine blade temperatures in a research engine for gas stream temperatures cycling between 1067 and 1567 k
[NASA-TM-X-71716] N75-23884

TURBINE ENGINES
Evolution of turboreactor control systems
N75-23588

TURBOFAN ENGINES
NASA refan program status --- for noise reduction of JT8D turbofan engine
[NASA-TM-X-71705] N75-23570

TURBOGENERATORS
Electric power generation utilizing a heat pipe turbine-generator
N75-24096
Variations in heat exchanger design for ocean thermal difference power plants
[PB-238572/2] N75-24134
TURBOJET ENGINES
An application of modern control theory to jet propulsion systems --- considering onboard computer
[NASA-TM-X-71726] N75-23573
Experimental transient turbine blade temperatures in a research engine for gas stream temperatures cycling between 1067 and 1567 k
[NASA-TM-X-71716] N75-23884
TURBOMACHINERY
Contribution of flight simulation tests to the study of turbomachine control
N75-23577
Numerical control of a turbomachine
N75-23590
Simulation techniques for turbomachines
N75-23591
TURBULENT FLOW
Problems in nonlinear mechanics of unstable waves in turbulent and in stratified shear flows. Part 1: Development of the noise-producing large-scale structure in a turbulent jet. Part 2: Nonlinear KelvinHelmholtz waves and the vertical mixing mechanism in a stratified shear flow. Part 3: Nonlinear interactions of the large-scale coherent structure and turbulence in a free shear flow
N75-23874
An analytical study of thermal turbulence --- turbulent natural convection induced by heat flux in a layer of fluid
N75-23876
An experimental investigation of the boundary layer under pack ice
[AD-A007335] N75-24049
Refractometric measurements in the Lacq area
N75-24206
Electromagnetic fields generated by turbulent air flow and shock waves
[WTHD-68] N75-24431
TURBULENT JETS
Problems in nonlinear mechanics of unstable waves in turbulent and in stratified shear flows. Part 1: Development of the noise-producing large-scale structure in a turbulent jet. Part 2: Nonlinear KelvinHelmholtz waves and the vertical mixing mechanism in a stratified shear flow. Part 3: Nonlinear interactions of the large-scale coherent structure and turbulence in a free shear flow
N75-23874
TURBULENT MIXING
An experimental investigation of the turbulent characteristics of co-axial jet flows and their role in aerodynamic noise generation
N75-24161
TURBULENT WAKES
Experimental study of the effect on span loading on aircraft wakes
[NASA-TM-X-62431] N75-23479
TWO DIMENSIONAL FLOW
Explicit finite-difference diagram for the solution of the problem of flow by about the establishment --- gas dynamics
[AD-A007410] N75-23902
Computational techniques for boundary layers
[SAND-74-5821] N75-24420

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U.S.S.R. SPACE PROGRAM
Apollo Soyuz test project press kit: USA-USSR
[NASA-NEWS-RELEASE-75-118] N75-23623
ITS-K infrared cryogenic telescope-spectro-meter aboard Salyut-4
[NASA-TT-F-16355] N75-23936
Biological experiments on Salyut-4
[NASA-TT-F-16267] N75-24321
Measurements of ion fluxes using RIEP-2801 M instrument on board Mars-4 and Mars-5 automatic interplanetary stations
[NASA-TT-F-16352] N75-24606
Preliminary results of research conducted aboard the Soviet Mars-4, Mars-5, Mars-6, and Mars-7 planetary probes
[NASA-TT-F-16333] N75-24615
Korolev: A chronicle --- a biography of Sergey Pavlovich Korolev
[NASA-TT-F-16278] N75-24654
Soviet bloc research in geophysics, astronomy, and space, no. 348
[JPRS-64770] N75-24662
UH-1 HELICOPTER
Aviator visual performance in the UH-1 study 2
[AD-A007812] N75-24357
ULTRAHIGH FREQUENCIES
UHF multipath phenomena in a marine environment
[COM-75-10266/5] N75-23841
Controllable liquid artificial dielectric S-band phase shifters
[AD-A007785] N75-23868
ULTRAHIGH VACUUM
Possible applications of surface treatment to ultrahigh vacuum friction for space utilization
N75-23626
Contact resistance studies of sintering using ultra clean copper surfaces in ultra high vacuum
N75-23983
Friction of the couples copper-copper, molybdenum-molybdenum, copper-molybdenum and copper-nickel in the ultrahigh vacuum
N75-24002
ULTRASONIC MACHINING
Ultrasonic pressure working of metals, chapters 2 and 3
[AD-A007695] N75-23783
ULTRASONIC RADIATION
Output energy optimization of a dye laser --- for intense flashlamp excitation, noting detrimental ultrasonic wave effect
N75-23807
ULTRASONIC TESTS
Determination of the shape, size, and orientation of defects by ultrasonic tests
N75-23749
ULTRASONIC WAVE TRANSDUCERS
High temperature ultrasonic transducers for in-sodium service
[HEDL-SA-726] N75-23937
ULTRASONIC WELDING
Aluminum ribbon and round wire bonding: Comparative analysis
[AD-A007513] N75-23777
ULTRASONICS
Studies on measuring ultrasonic flow with the aid of the Doppler effect
[NASA-TT-F-16393] N75-23928
ULTRAVIOLET RADIATION
Properties of uvrE mutants of Escherichia coli K12. Part 1: Effects of UV irradiation on DNA metabolism
[MBL-1974-25] N75-24332
Properties of uvrE mutants of Escherichia coli K12. Part 2: Construction and properties of pol and rec derivatives
[MBL-1974-26] N75-24333
Mutagenesis by ultraviolet radiation in bacteriophage PH1 X 174: On the mutation stimulating processes induced by ultraviolet radiation in the host bacterium
[MBL-1974-30] N75-24335
ULTRAVIOLET SPECTRA
The rocket ultraviolet spectrum of the planetary nebula NGC 7027
[NASA-TM-X-70892] N75-24594
The investigation of O and N2 densities from the OSO-7 extreme UV data
[NASA-CR-142759] N75-24644
UNCAMBERED WINGS
Experimental study of heat transfer during flow around uncambered delta wings with blunted edges
[AD-A007316] N75-23524
UNDERWATER ACOUSTICS
Report of NRL progress --- including fracture mechanics, plasma physics, underwater acoustics, and radio communication
[PB-238901/3] N75-24663
UNDERWATER ENGINEERING
Ocean engineering
[AD-A007297] N75-23812
Center for Technical Submarine Studies and Research
[NASA-TT-F-16385] N75-24361
UNDERWATER STRUCTURES
Ocean engineering
[AD-A007297] N75-23812
UNDERWATER VEHICLES
Ocean engineering
[AD-A007297] N75-23812
UNIFORM FLOW
System analysis of a piston steam engine employing the uniflow principle, a study in optimized performance
[NASA-TM-X-66818] N75-24544
UNITED STATES OF AMERICA
Statistical abstract of the United States, 1974
[COM-74-51149/4] N75-24524
UNIVAC COMPUTERS
Efficient simulation of a computer system --- for digital UNIVAC computers
N75-24381
UNIVAC 1108 COMPUTER
READY 1 system for the UNIVAC 1108 weapons effect program
[PB-239293/4] N75-24666
READY 1 system for the UNIVAC 1108 weapons preparation program
[PB-239294/2] N75-24667
UNSTEADY FLOW
Unsteady stall of a slender elliptic cylinder in a freestream of sinusoidally varying angle of incidence
N75-23473
Characterization of unsteady gas discharge from a vessel --- through orifice to atmosphere
[SAND-75-8207] N75-23892
One class of the exact solutions of the equations of Navier-stokes for unsteady flow of the compressible gas in channels
[AD-A007402] N75-23903
UNSTEADY STATE
Nonstationary aerodynamics of arbitrary cascades in compressible flow
N75-23474
UPPER ATMOSPHERE
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Jul. - Sep. 1974
[REPT-74/7-9] N75-24214
Kiruna geophysical data --- ground measurements of polar upper atmosphere parameters for Oct. - Dec. 1974
[REPT-74/10-12] N75-24215
Reaction rate data. Number 48: Annual summary of progress in FY 1974 DNA reaction rate program
[AD-A006574] N75-24216
The 03702 Honest John Missile No. 1005, round no. 645 AML
[AD-A007462] N75-24254
Atmospheric structure. Part 3: Upper air and surface data: Holloman Site
[AD-A007468] N75-24255
Solar activity and the motions of the upper atmosphere
N75-24267
Measurement of intensity and spectral characteristics of radiation in the Lyman-alpha line in the upper Martian atmosphere
[NASA-TT-F-16339] N75-24612
Soviet bloc research in geophysics, astronomy, and space, no. 348
[JPRS-64770] N75-24662
UPWELLING WATER
Physics of the sea and atmosphere
[NASA-TT-F-16225] N75-24262
Coastal upwelling on the east of the tropical zone of the North Atlantic and its relation to the stability of the northeast tradewind
N75-24264
Physical nature of the climatic and biological effects of the Peru current
N75-24279
URANIUM
Assessment of uranium and thorium resources in the United States and the effect of policy alternatives
[PB-238658/9] N75-24133
URANIUM PLASMAS
Absolute intensity of radiation emitted by uranium plasmas
[NASA-TM-X-71942] N75-24477
URBAN DEVELOPMENT
The airport/urban interface
[PB-238914/6] N75-23618
Environmental aspects of run-off and siltation in the Anacostia basin from hyperaltitude photographs
[NASA-TM-X-70888] N75-24067
URBAN PLANNING
Biography on the planning aspects of air pollution control, summary and evaluation
[PB-238927/8] N75-24182
Evaluation of policy related research in the field of municipal solid waste management
[PB-239375/9] N75-24547
Socio-psychological aspects of transportation, a background/resource paper for the Upper Great Lakes University Consortium for Transportation Research
[PB-238938/5] N75-24552
URBAN RESEARCH
Urban environmental health applications of remote sensing, summary report
[NASA-CR-141788] N75-24543
URBAN TRANSPORTATION
Guidelines for air quality maintenance planning and analysis. Volume 4: Land use and transportation considerations
[PB-237583/0] N75-24171
Design of high speed moving pavements for mass transit
[TT-7410] N75-24545
Socio-psychological aspects of transportation, a background/resource paper for the Upper Great Lakes University Consortium for Transportation Research
[PB-238938/5] N75-24552
USER MANUALS (COMPUTER PROGRAMS)
A users manual for a revised version of the Langley charring ablator program
[NASA-TM-X-72677] N75-23881
SPLASH programs user's guide
[COM-75-10181/6] N75-24288
Atlantic Oceanographic and Meteorological Labs (AOML) computer users guide --- including a general system description
[COM-75-10200/4] N75-24407
Manual for the use of particle trajectories programs to first order of the optic series
[ISN-74-12] N75-24447
READY 1 system for the UNIVAC 1108 weapons preparation program
[PB-239294/2] N75-24667

UTILITIES
The economic and environmental benefits from improving electrical rate structures
[PB-239451/8] N75-24541

V

V/STOL AIRCRAFT
Correlation of low speed wind tunnel and flight test data for V/STOL aircraft
[NASA-TM-X-62423] N75-23557
VACUUM DEPOSITION
Digital film and precipitation meter, and oil pollution metering device
N75-24657
VACUUM TESTS
Ames Heat Pipe Experiment [AHPE] experiment description document --- performance testing in a vacuum environment
[NASA-CR-114413] N75-23880
VANADIUM OXIDES
Thermal mechanism of the switching effect in oxidized vanadium
N75-24508
VAPOR DEPOSITION
Anelastic deformation of boron fibers --- vapor deposited fibers
[NASA-TM-X-71710] N75-23697
Chemical vapor deposition research for fabrication of solar energy converters
[PB-238947/6] N75-24137
VAPORIZING
Sodium sulfate: Vaporization thermodynamics and role in corrosive flames
[NASA-TM-X-71641] N75-23752
VARIABLE GEOMETRY STRUCTURES
Effects of geometric variables on the performance of a probe for direct measurement of free-steam stagnation pressure in supersonic flow
[NASA-TN-D-7887] N75-23470
VASCULAR SYSTEM
Pulse wave velocity over the vascular wall as a means for distinguishing between different psychophysiological reaction patterns to a mental task
N75-24302
VECTOR MESONS
Leptons production in hadronic collisions, partons, vector mesons and new particles
[PM/75/3] N75-24456
VECTOR SPACES
A note on irreducibility for linear operators on partially ordered finite dimensional vector spaces
[PB-239382/5] N75-24426
VENTS
Space LOX vent system --- for space shuttle orbiter
[NASA-CR-120769] N75-23685
VENUS [PLANET]
Innermost planets of the solar system
[NASA-CR-142827] N75-24627
Venus and Mercury as planets
[NASA-CR-142826] N75-24628
Mission to the inner planets --- Mariner 10 to investigate Venus and Mercury
[NASA-CR-142828] N75-24629
Venus and Mercury encounters
[NASA-CR-142829] N75-24630
VERTICAL TAKEOFF AIRCRAFT
Ground effects for jet lift VTOL
[NASA-TT-F-16359] N75-23480
VESTIBULES
Spinal effects of an electrical vestibular stimulation in man
[NASA-TT-F-16314] N75-24318
Role of metabolic shifts in the pathogenesis of vestibular disturbances
[NASA-TT-F-16431] N75-24327
VIABILITY
Properties of uvrE mutants of Escherichia coli K12. Part 2: Construction and properties of pol and rec derivatives
[MBL-1974-26] N75-24333
VIBRATION EFFECTS
Investigation of effects of vibration on a structure --- working in real time
[NASA-TT-F-16305] N75-23926
VIBRATION MEASUREMENT
Natural oscillations of liquid in a horizontal container with symmetric double-connected cross section
[AD-A007312] N75-23906
VIBRATION MODE
Static, vibration, and stability analyses of anisotropic plates
N75-24020
Vibration analysis of skewed cantilever systems: Helicoidal shells and plates
N75-24026
VIBRATION TESTS
Laser geodynamic satellite thermal/optical/vibrational analyses and testing. Volume 1: Executive summary --- retroreflector performance
[NASA-CR-120754] N75-23933
Laser geodynamic satellite thermal/optical/vibrational analyses and testing, volume 2, book 1 technical report --- retroreflector performance
[NASA-CR-120755] N75-23934
Laser geodynamic satellite thermal/optical/vibrational analysis and testing, volume 2, book 2 --- cubes and far fields
[NASA-CR-120756] N75-23935
VIBRATIONAL SPECTRA
Vibrational intensity distributions for continuum photoionization of oxygen
[NASA-CR-142748] N75-24438
VIDEO DATA
Specification of the timing stabilities of broadcast monochrome and PAL colour television signals
[BBC-RD-1975/14] N75-23818
VIDEO EQUIPMENT
Design, evaluation and applications of a vidicon rapid scanning spectrophotometer
N75-23913
VIKING LANDER SPACECRAFT
Radiometric performance of the Viking Mars lander cameras
[NASA-TM-X-72692] N75-23921
VIKING MARS PROGRAM
Radiometric performance of the Viking Mars lander cameras
[NASA-TM-X-72692] N75-23921
VIKING 75 ENTRY VEHICLE
Viking entry vehicle aerodynamics at m equals 2 in air and some preliminary test data for flight in CO2
[NASA-TN-D-7974] N75-23515
VINYLIDENE
Pyroelectric film/liquid crystal detector for 10.6 micrometers region --- using vinylidene
[AD-A007852] N75-23949
VIRGINIA
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region --- air pollution control studies in Virginia
[NASA-CR-142820] N75-24120
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region. Attachment 3: Data set for Craney Island oil refinery installation experiment --- air pollution monitoring
[NASA-CR-142823] N75-24121
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 4: Data set for background investigation of atmospheric constituents for Nansemond River site --- a proposed oil refinery site
[NASA-CR-142821] N75-24122
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 5: Data set for background investigation of atmospheric constituents for Richmond, Virginia area --- air pollution monitoring
[NASA-CR-142822] N75-24164
VIRUSES
Respiratory and intraperitoneal infection of mice with encephalomyocarditis virus: Effect of sublethal X-irradiation on host resistance and survival
[MBL-1975-2] N75-24331
VISCOMETERS
An oscillating-cup viscometer for high pressure, high temperature mercury
N75-23916
VISUAL ACUITY
On rod visual acuity and cone visual acuity --- color vision and light adaptation
[NASA-TT-F-16315] N75-24323
VISUAL OBSERVATION
Aerodrome air traffic control in the Canadian Forces --- design of tower cabs for air traffic controller tasks
[DCIEM-74-R-1067] N75-24363
VISUAL PERCEPTION
Shallow Habitat Air Dive series [SHAD 1 and 2]: The effects on visual performance and physiology
[AD-A007104] N75-24342
Aviator visual performance in the UH-1 study 2
[AD-A007812] N75-24357
Advanced helmet mounted sight study program
[AD-A007874] N75-24366
VISUAL SIGNALS
Predictive validities of several clinical color vision tests for aviation signal light gun performance
[AD-A606792] N75-24317
Visual and auditory information processing aspects of the acquisition of flying skill
[AD-A007721] N75-24358
VOICE DATA PROCESSING
Design of a digital voice data compression technique for orbiter voice channels
[NASA-CR-141790] N75-23820
VOID RATIO
Field evaluation of void spacing indicator --- reliability control of concrete pavements
[PB-239044/1] N75-24019
VOIDS
Void nucleation and growth in heavy ion and electron bombarded pure metals --- considering He influence
[COO-2206-5] N75-23763
VOLTMETERS
Application of computer controlled monitoring and data reduction to potentiometry and voltammetry
N75-24380
VON ZEIPEL METHOD
An accelerated elimination technique for the solution of perturbed Hamiltonian systems --- von Zeipel method
N75-24417
VORTICES
Analysis of wake vortex flight test data behind a T-33 aircraft
[NASA-CR-137669] N75-23482

W

WAKES
Flow of a particulate suspension in the wake of a circular cylinder
N75-23471
Velocity and rolling-moment measurements in the wake of a swept-wing model in the 40 by 80 foot wind tunnel
[NASA-TM-X-62414] N75-23481
Analysis of wake vortex flight test data behind a T-33 aircraft
[NASA-CR-137669] N75-23482
WARNING SYSTEMS
River forecasts provided by the National Weather Service. Volume 2: 1973
[COM-75-50005/8] N75-24243
WASTE DISPOSAL
Lubricating oil burn-off in Coast Guard power plants
[AD-A007313] N75-23811
Evaluation of policy related research in the field of municipal solid waste management
[PB-239375/9] N75-24547
WASTE ENERGY UTILIZATION
Production of gaseous fuel by pyrolysis of municipal solid waste
[NASA-CR-141791] N75-24105
WASTE UTILIZATION
Conversion of cattle feedlot wastes to ammonia synthesis gas
[PB-239668/7] N75-23692
Where the boilers are: A survey of electric utility boilers with potential capacity for burning solid waste as fuel
[PB-239392/4] N75-24135
WATER
Cavitation inception thresholds in water and nuclei spectra by light scattering technique
[PB-238448/5] N75-23895
Comparison of two nucleus spectrum measuring devices and the influence of several variables on cavitation threshold in water
N75-23915
WATER CURRENTS
Drift current in a thin surface layer of the ocean
N75-24265
WATER FLOW
An experimental photographic investigation of vapor bubble collapse and liquid jet impingement
[PB-239019/3] N75-23909
WATER MANAGEMENT
The use of ERTS imagery in reservoir management and operation --- New England
[E75-10286] N75-24059
Proceedings from the Gulf States Conference on Coastal Zone Management
[COM-75-10201/2] N75-24081
More water for arid lands, promising technologies and research opportunities
[PB-239472/4] N75-24089
WATER POLLUTION
Water hyacinths and alligator weeds for removal of silver, cobalt, and strontium from polluted waters
[NASA-TM-X-72727] N75-24163
Marine pollution monitoring [petroleum]: Proceedings of a Symposium and Workshop held at the National Bureau of Standards
[COM-75-50071/0] N75-24183
A method for the separation of oil from an aqueous oil, detergent solution prior to IR analysis, part 2
[AD-A006826] N75-24188
Preliminary assessment of the environmental problems associated with vinyl chloride and polyvinyl chloride
[PB-239110/0] N75-24196
WATER QUALITY
Proceedings of seminar on methodology for monitoring the marine environment
[PB-239052/4] N75-24178
WATER RESOURCES
Use of interactive computer graphics in water resources planning and management
[PB-238631/6] N75-24079
More water for arid lands, promising technologies and research opportunities
[PB-239472/4] N75-24089

WATER RUNOFF
Environmental aspects of run-off and siltation in the Anacostia basin from hyperaltitude photographs
[NASA-TM-X-70888] N75-24067
WATER TEMPERATURE
The role of large-scale atmospheric circulation in the formation of temperature anomalies in surface waters as illustrated by the northern part of the Pacific Ocean
N75-24266
WATER TREATMENT
A method for determining oil in water
[AD-A007871] N75-23734
WATER VAPOR
Preliminary results of measuring water vapor content in planetary atmosphere from measurements on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16337] N75-24613
WATER WAVES
Wave induced motions and loads on ships in oblique waves
[REPT-193-S] N75-23810
Observations of short period internal waves generated by shear flow instability --- temperature gradients
N75-23871
Physics of the sea and atmosphere
[NASA-TT-F-16225] N75-24262
Some results of the hydrodynamic theory of finite-amplitude waves
N75-24275
Calculations of the heights, periods, profile parameters, and energy spectra of wind waves
N75-24276
Temperature waves in a stratified sea
N75-24277
Laboratory investigation of internal wave generation models --- surface tides transfer energy to internal waves at continental shelf breaks
[AD-A007351] N75-24284
WATERSHEDS
The use of ERTS imagery in reservoir management and operation --- New England
[E75-10286] N75-24059
Applications of remote sensing to watershed management
[NASA-TM-X-70896] N75-24072
Determining land use changes in watersheds by aerial photographic measurements
[PB-239192/8] N75-24080
Correlation of hydrologic model parameters with changing land use as determined from aerial photographs
[PB-239407/0] N75-24093
WATERWAVE ENERGY
Calculations of the heights, periods, profile parameters, and energy spectra of wind waves
N75-24276
WAVE AMPLIFICATION
Some results of the hydrodynamic theory of finite-amplitude waves
N75-24275
Electron plasma oscillations in a static electric field
[TRITA-EPP-74-21] N75-24484
WAVE DIFFRACTION
Research on the influence of dislocations on the diffraction of X rays and gamma rays on copper single crystals
N75-23751
Real-time wavefront correction through Bragg diffraction of light by sound waves
N75-24433
WAVE EQUATIONS
On the generalization of Kirchhoff formula
[NASA-TT-F-16332] N75-24430
WAVE FRONT RECONSTRUCTION
Real-time wavefront correction through Bragg diffraction of light by sound waves
N75-24433
WAVE FRONTS
Passive ranging with wavefront sampling
[AD-A007387] N75-23836
WAVE INCIDENCE CONTROL
Interaction of shock wave with wedge, which moves at supersonic speed
[AD-A007302] N75-23519
WAVE PROPAGATION
Proceedings of the Canadian Workshop on acoustic surface waves --- signal processing and wave propagation
[CRC-R-1260] N75-23821
Finite difference methods for transient signal propagation in stratified dispersive media
N75-24427
Non-linear wave propagation in heterogeneous anisotropic plates
N75-24428
Focusing problems in wave propagation: A method based on almost plane waves
N75-24461
WAVE SCATTERING
Electron laser-pulse scattering
N75-23961
WAVEFORMS
Complex waveform phonetic speech synthesis
N75-23814
Calculation of rotational nonequilibrium in a pulsed HF laser
[UCRL-75814] N75-23969
WAVEGUIDES
The generation of step-tunable far infrared radiation by phase matched difference frequency mixing in planar dielectric waveguides
N75-23963
WAVES
Electron photon interactions in semiconductors
N75-24465
WEAPON SYSTEMS
Aerospace Defense Command Weapon System Evaluation Program plan [WSEP]
[AD-A007690] N75-24665
WEAR TESTS
The friction and wear of self lubricating polythenes
N75-23998
Third body formation and elimination on carbon fiber epoxy composite --- effects on friction and wear
N75-24004
Composite self lubricating materials for space applications
N75-24005
WEATHER FORECASTING
An indirect method for measuring surface based temperature inversions --- air pollution monitoring
[AD-A007872] N75-23950
Evaluation of probability forecasts in meteorology
N75-24226
Aviation: Automatic Weather Observing System [AV-AWOS] preliminary system description
[AD-A007697] N75-24229
Operations of the National Weather Service, 1974
[COM-75-10194/9] N75-24239
An evaluation of the National Meteorological Center's experimental boundary layer model
[COM-75-10267/3] N75-24259
WEATHER MODIFICATION
Collected reprints: 1971-1972: Atmospheric physics and chemistry laboratory --- considering weather modification
[COM-75-10260/8] N75-24258
WEATHER STATIONS
Evaluation of a Digital Display System [DDS] driven by an Automatic Meteorological Observing System AMOS 3-70
[AD-A008898] N75-23546
Aviation: Automatic Weather Observing System [AV-AWOS] preliminary system description
[AD-A007697] N75-24229
Mesonetwork array: Its effect on thunderstorm flow resolution --- wind
[COM-75-10248/3] N75-24257
WEDGES
Interaction of shock wave with wedge, which moves at supersonic speed
[AD-A007302] N75-23519
WEIGHT MEASUREMENT
Flight test for the feasibility evaluation of the Chadwick Electronic Weighing System [CHEWS]
[AD-A007516] N75-23522
WEIGHTLESSNESS
Zero-gravity atmospheric Cloud Physics Experiment Laboratory; Programmatics report
[NASA-CR-120725] N75-24526
WELD STRENGTH
Characteristics of HY-180 and Ti-100 for welded high strength structures
[AD-A006758] N75-23782
Determination of transverse weld yield strength on thin plate
[AMSR.0039.74] N75-24039
WELDING
Analysis of thermal stresses and metal movement during welding
[NASA-CR-120757] N75-23754
WHISTLERS
The effects of field aligned ionization models on the electron densities and total flux tubes contents deduced by the method of whistler analysis
[AERONOMICA-ACTA-A-139-1974] N75-24205
WIDE ANGLE LENSES
Acoustic lens design
[AD-A007847] N75-24435
WILDLIFE
Utilization of Skylab EREP system for appraising changes in continental migratory bird habitat --- using multispectral band scanner
[E75-10281] N75-24054
WIND (METEOROLOGY)
Mesonetwork array: Its effect on thunderstorm flow resolution --- wind
[COM-75-10248/3] N75-24257
READY 1 system for the UNIVAC 1108 attack conditions program
[PB-239295/9] N75-24668
WIND EFFECTS
Calculations of the heights, periods, profile parameters, and energy spectra of wind waves
N75-24276
WIND MEASUREMENT
Experimental pulsed laser, remote crosswind measurement system, feasibility study and design, part 2
[AD-A007350] N75-23981
Updraft properties deduced from Rawinsoundings
[COM-75-10193/1] N75-24240
WIND RIVER RANGE [WY]
Preliminary analysis of the Beaver Creek and Ninemile Hill areas, Wind River Basin, Wyoming using image ratios and thematic classification
[E75-10287] N75-24060
WIND TUNNEL MODELS
Twin jet exhaust system test techniques --- integrating airframe and propulsion system for wind tunnel models
N75-23500
Some problems of modelling aeroelastic phenomena in a transonic tunnel
[AD-A007391] N75-23561
Comparison of flight measurements with predictions from aeroelastic models in the NASA Langley Transonic Dynamics Tunnel
[NASA-TM-X-72686] N75-23610
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [iA14B], volume I
[NASA-CR-141522] N75-23647
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [IA14B], volume 2
[NASA-CR-141523] N75-23648
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the 11-foot unitary plan wind tunnel for Mach 0.6 and 0.9 [0A22A]
[NASA-CR-141529] N75-23649
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the arc 9 by 7-foot unitary plan wind tunnel for Mach 1.55 and 2.2 [OA22B]
[NASA-CR-141530] N75-23650
WIND TUNNEL TESTS
Isolating nozzle afterbody interaction parameters and size effects: A new approach --- flight and wind tunnel tests with A 7 aircraft
N75-23503
Reynolds number effects on boattail drag of exhaust nozzles from wind tunnel and flight tests
N75-23506
Airframe: Engine interaction for engine configurations mounted above the wing. Part 2: Engine jet simulation problems in wind tunnel tests
N75-23512
Correlation of low speed wind tunnel and flight test data for V/STOL aircraft
[NASA-TM-X-62423] N75-23557
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 3
[NASA-CR-134445] N75-23657
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 4
[NASA-CR-134446] N75-23658
Airloads investigation of an 0.30-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 5
[NASA-CR-134447] N75-23659
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 6
[NASA-CR-134448] N75-23660
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 7
[NASA-CR-134449] N75-23661
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the arc 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 8
[NASA-CR-134450] N75-23662
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 9
[NASA-CR-141501] N75-23663
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140 A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for MACH range 0.6 to 1.4 [IA14A], volume 10
[NASA-CR-141502] N75-23664
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 11
[NASA-CR-141503] N75-23665

Results of transonic wind tunnel tests on an 0.010-scale space shuttle mated vehicle model 72-OTS in the LaRC 8-foot TPT [IA43]
[NASA-CR-141525] N75-23666
Problems relating to wind tunnel simulation of relaxing flows
[AD-A007406] N75-23900
WIND VELOCITY
Cloud motion in relation to the ambient wind field
[NASA-CR-2557] N75-24233
WINDPOWER UTILIZATION
Oceanic and atmospheric energy sources
N75-24101
Proceedings of 5th annual symposium: Energy Research and Development --- solar energy, windpower utilization, thermonuclear power generation
[AD-A007799] N75-24142
WING FLAPS
Effectiveness of spoilers on the GA[W]-1 airfoil with a high performance Fowler flap
[NASA-CR-2538] N75-23484
WING LOADING
Experimental study of the effect on span loading on aircraft wakes
[NASA-TM-X-62431] N75-23479
WING PANELS
Design and fabrication of Rene 41 advanced structural panels --- their performance under axial compression, shear, and bending loads
[NASA-CR-132646] N75-24032
WING PLANFORMS
Effect of wing planform and canard location and geometry on the longitudinal aerodynamic characteristics of a close-coupled canard wing model at subsonic speeds
[NASA-TN-D-7910] N75-23514
WING SPAN
Experimental study of the effect on span loading on aircraft wakes
[NASA-TM-X-62431] N75-23479
WING-FUSELAGE STORES
Prediction of the optimum location of a nacelle shaped body on the wing of a wing-body configuration by inviscid flow analysis
N75-23510
WINGS
Surface finishing --- particularly for use in smoothing irregularities on aluminum aircraft wings
[NASA-CASE-MSC-12631-1] N75-23476
Detailed experimental and theoretical analysis of the aerodynamic interference between lifting jets and the fuselage and wing
N75-23509
Airframe: Engine interaction for engine configurations mounted above the wing. Part 1: Interference between wing and intake jet
N75-23511
Account of shearing strain during the calculation of the oscillations of low aspect-ratio wing by the method of polynomials
[AD-A007397] N75-23518
Method of the optimization of the load-carrying structure of wing on rigidity during variation by the distribution of thickness ratio
[AD-A007317] N75-23521
Wing longitudinal stability criteria
[AD-A007430] N75-23527
Computer-augmented design of aircraft wing structures
N75-23554
WIRE
Preparation and properties of tungsten-wire reinforced NiCr 80-20
[NASA-TT-F-16275] N75-23696
WISCONSIN
Evaluation of the application of ERTS-1 data to the regional land use planning process --- Northeast Wisconsin
[E75-10280] N75-24053
WORK FUNCTIONS
Variations in the work function of [100]W by the adsorption of oxygen, the adsorption of cesium and the coadsorption of oxygen and cesium
[NASA-TT-F-16364] N75-23725
WORLD DATA CENTERS
World Weather Watch: Seventh status report on implementation
[WMO-401] N75-24234

X

X RAY ANALYSIS
X-ray analysis of metal traces in petroleums using ion exchange membranes
[NASA-TT-F-16288] N75-23724
X RAY ASTRONOMY
Si[Li] X-ray astronomical spectroscopy
[NASA-TM-X-70894] N75-23924
Temporal X-ray astronomy with a pinhole camera -- - cygnus and scorpius constellation
[NASA-TM-X-70893] N75-24596
X RAY FLUORESCENCE
X-ray analysis of metal traces in petroleums using ion exchange membranes
[NASA-TT-F-16288] N75-23724
X RAY LASERS
A computer code for time dependent recombination lasers --- to solve population inversion problems
[AD-A007292] N75-23975
X RAY SOURCES
General safety standard for installations using nonmedical X-ray and sealed gamma-ray sources, energies up to 10 MeV
[COM-75-50166/8] N75-24353
Spectral variability of Cyg X-3 --- X ray sources
[NASA-TM-X-70891] N75-24595
X RAY SPECTROSCOPY
Si[Li] X-ray astronomical spectroscopy
[NASA-TM-X-70894] N75-23924
X RAYS
The influence of ionizing radiation on the immune response
[MBL-1974-28] N75-24329

Y

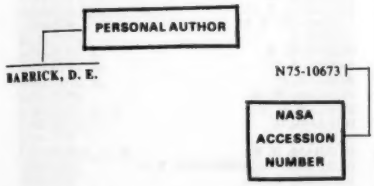
YAGI ANTENNAS
Perturbation techniques for directivity optimization of Yagi-Uda arrays
N75-23813
YIELD POINT
On an approximate yield criterion for thin steel shells
[PB-239166/2] N75-24040
YIELD STRENGTH
Determination of transverse weld yield strength on thin plate
[AMSR.0039.74] N75-24039

Z

ZINC SELENIDES
Determination of the stress-optic coefficients of Zn Se
[AD-A007778] N75-24467
ZIRCONIUM ALLOYS
Observations of phases and volume changes during precipitation of hydride in zirconium alloys
[AE-499] N75-23762
Metallurgy Department
[RISO-304] N75-23771
ZIRCONIUM CARBIDES
Temperature dependence of particulate erosion --- tungsten and zirconium carbides
[AD-A007841] N75-24459

PERSONAL AUTHOR INDEX

TYPICAL PERSONAL AUTHOR INDEX LISTING



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

AAS, H. G. N75-23946
ABDALLA, K. L. N75-23570
ABDEL-GAWAD, M. N75-24061
ABEL, P. G. N75-24260
ABRAMOWITZ, R. N75-23673
ABSTON, C. C. N75-24221
ACKERSON, K. L. N75-24209
ACKLEY, S. F. N75-24048
ACUNA, M. H. N75-24642
ADAMS, C. E. N75-24188
ADAMS, D. N75-24121
N75-24122
N75-24164
ADAMS, J. W. N75-23826
ADE, P. A. R. N75-24568
AGARWAL, K. L. N75-24492
AHMED, S. R. N75-23510
AHRENS, T. J. N75-24638
AITKEN, D. K. N75-24562
AKERS, F. I. N75-24441
AKIM, E. L. N75-24617
ALDRED, A. T. N75-24510
ALDRICH, C. H., III N75-23875
ALEKSANDROV, A. A. N75-24280
ALEKSANDROV, Y. N. N75-24625
ALEKSEEYEV, V. V. N75-24280
ALEKSEYEV, N. V. N75-24645
ALESHIN, V. I. N75-24617
ALI, A. W. N75-23975
ALLEN, J. H. N75-24221
ALLEN, S. D. N75-24466
ALLEY, M. M. N75-24071
ALVAREZ, J. A. N75-24566
AMATEAU, M. F. N75-23715
AMBLER, R. K. N75-24306
AMENDA, W. N75-24479
AMORY, W. N75-24393
AMSDEN, A. A. N75-23893
ANAGNOSTOU, E. N75-24109
ANDERSON, E. B. N75-23544
ANDERSON, R. L. N75-24156
ANDERSON, T. D. N75-24126
ANDRIESSE, C. D. N75-24563
N75-24587
ANGELL, J. K. N75-24181
ANSTEAD, R. J. N75-23853
ANUCHIN, V. N. N75-24281
APPEL, C. N75-24039
APRUZESE, J. P. N75-24603
ASHBY, E. C. N75-23779
ASHFORD, N. N75-23612
ASHLEMAN, B. T. N75-24345
ASHLEY, G. K., II N75-24649
ASSEMAT, J. L. N75-24499
ATKINS, K. L. N75-23674
ATTERNO, R. N75-23762
AULEHLA, F. N75-23497
AUVINET, J. N75-23708
AVDUYEVSKIY, V. S. N75-24617
AVGUSTINIK, A. I. N75-23781
AYER, F. A. N75-24179
AYERS, K. B. N75-24545
AZEMA, A. N75-24465
AZOU, P. N75-23749

B

BABICHENKO, C. I. N75-24612
BACCHETTI, S. N75-24340
BACKUS, C. E. N75-24136
BAILEY, M. W. N75-23993
BAK, P. N75-23772
BALE, J. B. N75-24087
BALICK, B. N75-24574
N75-24590
BALKANSKI, M. N75-24013
N75-24501
BALL, W. H. N75-23507
BALUTEAU, J. P. N75-24580
BANDY, A. N75-24121
N75-24164
BANDY, E. C. N75-24120
N75-24122
BANISTER, B. N. N75-24019
BARAONA, C. R. N75-24117
N75-24119
BARATOV, A. N. N75-23737
BARBEE, T. W., JR. N75-24509
BARBOT, A. N75-23588
N75-23591
BARKSDALE, W. J. N75-23843
BARLOW, M. J. N75-24559
BARNES, S. L. N75-24257
BARQUINS, M. N75-24002
BARROWS, R. F. N75-23883
BARSUKOV, F. I. N75-23822
N75-23854
BARTHLOME, D. E. N75-23987
BASTIEN, P. N75-23749
BAUDET, P. N75-24500
BAUER, F. N75-23805
BAUERFEIND, K. N75-23584
BAUGHMAN, M. L. N75-24140
BAZERGUI, A. N75-23918
BAZHINOV, I. K. N75-23637
BAZILEVSKIY, A. T. N75-24622
BEACH, H. L. N75-23885
BEACH, H. L., JR. N75-23571
BECK, G. N75-24029
BECKLIN, E. E. N75-24561
BEEBE, R. N75-24639
BEECKMAN, R. N75-24422
BEESTON, J. M. N75-23711
BEGLEY, R. F. N75-24469
BEHNERT, R. N75-23480
BELLEVILLE, R. L. N75-24371
BENJAMIN, R. F. N75-23972
BENNE, R. N75-24314
N75-24340
BENOIT, P. N75-24464
BENSEMA, W. D. N75-23826
BENTZ, C. E. N75-23582
BENVENUTI, P. N75-24575
BERES, D. P. N75-24026
BERGER, S. N75-24524
BERGQVIST, H. N75-23762
BERMAN, M. N75-24400
BERNAT, A. P. N75-24598
BERNATOWICZ, D. T. N75-23681
BERNOT, P. T. N75-23651
BERTH, M. N75-23917
BERTKE, S. D. N75-23905
BERTO, Z. L. N75-24612
BERZRUKIKH, V. V. N75-24611
BESERMAN, R. N75-24013
BESIGK, G. N75-23497
BETH, C. N75-23590
BEVER, R. S. N75-23849
BHANDARKAR, M. D. N75-23768
BHAT, G. R. N75-23785
BHAT, S. K. N75-24475
BHAVE, D. G. N75-24490
BHUMRALKAR, C. M. N75-24251
BIERIG, R. N75-23860
BIESS, J. J. N75-23679
BILLINGSLEY, J. C. N75-24192
BILLS, K. W., JR. N75-23800
BINET, M. N75-24500
BISHOP, P. T. N75-23699
BISSONNETTE, L. R. N75-23965
BITNER, J. R. N75-24386
BITTER, M. N75-24481
BLACKWELL, J. N75-23999
BLAIS, R. N75-24120
N75-24121
N75-24122
N75-24164
BLAMON, Z. N75-24612
BLATZ, P. J. N75-23800
BLEICHRODT, J. F. N75-24334
N75-24335
BLOM, J. L. N75-24301
BLOOM, E. E. N75-23973
BLOTTNER, F. G. N75-24420
BLUNDO, G. N75-24303
BLYUGER, V. F. N75-23613
BOATENG, A. N75-23747
BOBBITT, J. I. N75-24461
BOCCON-GIBOD, D. N75-24500
BOCHONKO, D. R. N75-24602
BOCK, P. N75-24059
BOGAERTS, W. J. C. N75-24331
BOGDANOV, A. V. N75-24606
BOHLIN, R. C. N75-24594
BOISSIER, J. N75-24030
BOKHONOV, M. I. N75-24623
BOLDT, E. A. N75-24595
BOLLINGER, W. N75-23522
BONNET, M. N75-24318
BOOTHBY, J. N75-23612
BORGER, W. U. N75-23605
BORGIOTTI, G. V. N75-23840
BORGMAN, J. N75-24585
BORISENKO, A. A. N75-23781
BORISENKO, I. G. N75-23625
BORKO, B. N75-24539
BORODIN, N. F. N75-23631
N75-24617
BOSELLY, S. E., III N75-24256
BOSTON, N. E. J. N75-23951
BOTINEAU, J. N75-24465
BOTTENBERG, W. N75-23868
BOTTICELLI, R. A. N75-23940
BOUTWELL, K. N75-24513
BOWER, H. F. N75-23839
BOWERS, G. L. N75-24373
BOYER, A. N75-23695
BOYER, K. N75-23972
BRAATZ, P. O. N75-23949
BRADLEY, R. N75-23603
BRADY, A. G. N75-24223
N75-24224
N75-24225
BRAMMAR, W. J. N75-24311
BRANDENBERGER, G. N75-24326
BRANDHORST, H. W. N75-24117
N75-24119
BRANDT, N. B. N75-23787
BRAREN, R. N75-24134
BRAUNSTEIN, A. N75-24466
BRAUNSTEIN, M. N75-24466
BRAZIER, M. E. N75-23507
BRECKENRIDGE, S. L. N75-24593
BREESE, M. E. N75-23862
BRELLO, E. Y. N75-23931
BRELOT, A. N75-24499
BRENNAN, P. J. N75-23882
BRESSETTE, W. E. N75-24068
BRIDGES, D. W. N75-24105
BRIDWELL, J. D. N75-23829
BRINKLEY, K. L. N75-23881
BRISCOE, B. J. N75-23998
BRISTOW, M. N75-23974
BROCADESZAALBERG, O. N75-24329
BRODER, J. D. N75-23668
BROMBERG, K. N75-23742
BROWN, H. L. N75-24144
BROWN, J. N75-24082
BROWN, R. D. N75-24608
BROWN, R. E. N75-24133
BROWN, R. L. N75-24590
BRUN, T. O. N75-24450
BRUNET, M. N75-23590

BRUNSCHE, K. N75-23709
BRUSSE, J. N75-23567
BRYAN, M. L. N75-24064
N75-24065
BRYAN, R. J. N75-24197
BUBE, R. H. N75-24146
BUCH, A. N75-24031
BUCH, F. N75-24146
BUCHER, W. N75-23603
BUENING, H. J. N75-24185
BUKLANOV, V. V. N75-24278
BULLEN, R. H., JR. N75-24389
BUNKER, A. F. N75-24285
BUNKOV, V. G. N75-23518
BURCH, E. E. N75-23956
BURCHER, E. E. N75-23921
BURGMANN, W. S. N75-24256
BURNHAM, J. B. N75-24133
BURT, J. R., JR. N75-23526
BURTSCHER, J. N75-23850
BURTSEV, V. P. N75-23631
BURZO, E. N75-23770
BUSHNELL, D. J. N75-24012
BUSSOLETTI, E. N75-24580
N75-24591
BUTZ, J. R. N75-23888
BUYCO, E. H. N75-24111
BUZNEA, D. N75-24660
BYER, R. L. N75-24469
BYFORD, G. H. N75-24305
BYRKIN, A. P. N75-23903
N75-23908
BYRON, S. R. N75-23980

C

CALI, J. P. N75-23941
CALKINS, D. J. N75-24050
CALLAHAN, C. J. N75-23489
CALVIN, M. N75-24369
CAMPBELL, G. H. N75-24409
CAMPBELL, J. F. N75-23686
CARASSO, M. N75-24128
CARLETON, H. N75-23869
N75-24289
CARLSON, C. R. N75-24536
CARRE, J. P. N75-23495
CARTER, E. C. N75-23488
CARTWRIGHT, D. C. N75-24218
CARVER, K. R. N75-23841
CARY, L. E. N75-24227
CASSAN, J. H. F. N75-23889
CATALANO, J. F. N75-23745
CATHELIN, M. N75-23917
CATO, G. A. N75-24185
CELLARIUS, R. A. N75-24162
CHAMBERLIN, R. N75-23506
CHANE, J. P. N75-24500
CHANEY, L. W. N75-23726
CHANG, D. T. N75-24056
CHAPMAN, G. H. N75-23773
CHATIGNY, M. A. N75-24294
N75-24296
CHATTOT, J. J. N75-23493
CHEMLA, D. S. N75-24469
CHEN, C. A. N75-23813
CHEN, E. P. N75-23717
CHENG, L. L. N75-24392
CHERNAYA, I. M. N75-24622
CHESWORTH, E. T. N75-24202
CHEVRIER, J. C. N75-24029
CHEW, J. R. N75-23818
CHIEN, Y. T. N75-24079
CHILD, R. D. N75-23558
CHIREYKIN, L. V. N75-24316
CHISTOV, Y. I. N75-23517
CHIU, C. B. N75-23894
CHIUCHIOLO, E. A. N75-23886
CHOBY, D. A. N75-23602
CHOI, E. S. H. N75-24405
CHOU, C. K. N75-24347
CHOY, M. M. N75-24469
CHUDNOV, V. N75-24193
CHUDNOVSKII, F. A. N75-24508
CHUPP, E. L. N75-23922
CHUVAKHIN, S. P. N75-24612
CICERONE, R. J. N75-24162
CICOLANI, L. N75-23606
CIFFONE, D. L. N75-23479
CITTI N75-24530
CLAPP, J. A. N75-24387
N75-24393
CLAPP, J. L. N75-24053
CLARK, J. N75-24431
CLARKE, R. N. N75-23863
CLAUDSON, T. T. N75-24038
CLEGG, P. E. N75-24568
CLEVENSON, S. A. N75-23556
CLIPP, C. N75-24091
CLOUTIER, P. D. N75-24147
CLYNCH, J. R. N75-24473
COCKSHUTT, E. P. N75-23592
COHEN, G. A. N75-24037
COHEN, M. N75-24559
COHEN, R. J. N75-24589
COHEN, R. W. N75-24536
COHEN, S. N75-23861
COLE, H. S. N75-23765
COLLINS, W. E. N75-24317
COLWELL, R. N. N75-24063
COMPTON, W. A. N75-23597
COMPTON, W. B., III N75-23501
CONDE, E. N75-24006
N75-24015
CONNELL, J. W. N75-24134
CONOLLY, J. I., JR. N75-23979
CONTE, D. N75-24087
COOK, W. L. N75-23557
COOMBES, T. D. N75-23502
COOPER, S. N75-24059
COPELAND, G. N75-24120
N75-24121
N75-24122
N75-24164
COROTIS, R. B. N75-24238
CORSIGLIA, V. R. N75-23479
N75-23481
COSEL, R. M. N75-23530
N75-23545
COTTINGTON, R. V. N75-23594
COUCH, L. M. N75-23470
COURTEL, R. N75-24002
COURTNEY, T. H. N75-23712
CRAIN, I. K. N75-24077
CRAMOND, R., JR. N75-24021
CRANE, J. F. W. N75-23498
CRANE, R. W. N75-23911
CRANE, T. H. N75-24105
CRANNELL, C. J. N75-24646
CRANSTON, R. L. N75-23553
CRAWFORD, B. S. N75-23654
CREIGHTON, J. R. N75-23969
CRISFIELD, M. A. N75-24040
CROCQ, L. N75-24307
CROSMUN, R. V. N75-23722
CROSSWHITE, H. M. N75-23732
CUNDELL, A. M. N75-24191
CURTIN, J. G. N75-24368
CURTIS, H. B. N75-23753
CYGNOR, J. E. N75-23601

D

DANCHICK, R. N75-24197
DANIEL, I. M. N75-23707
DANILENKO, A. I. N75-24625
DARLINGTON, C. R. N75-24192
DASILVA, L. C. N75-24051
DAVID, A. N75-24531
DAVIDSON, G. R. N75-24510
DAVIES-JONES, R. P. N75-24240
DAVIS, J. P. N75-24154
DAVIS, R., JR. N75-24652
DAVIS, T. M. N75-24203
DAVIS, W. A. N75-23816
DAVYDOVA, N. A. N75-23524
DAVYDOVA, N. I. N75-24219
DAY, C. K. N75-23937
DAYTON, M. P. N75-24255
DEBREBISSON, M. N75-23847
DEGENFORD, J. E. N75-23848
DEGONIA, P. K. N75-23632
DEGRAAF, E. A. B. N75-24016
N75-24017
DEHAAN, A. N75-23757
DEJONG, L. P. A. N75-24310
DELABY, J. C. N75-23695
DELERY, J. N75-23491
DELIL, A. A. M. N75-24001
DELLER, R. W. N75-23719
DEMARS, G. N75-23860
DEMENTYEVA, N. N. N75-24612
DERICHEMONT, G. N75-23491
DESPLAT, J. L. N75-23725
DEUEL, C. L. N75-23960
DEVADDER, D. N75-23749
DEVILLIERS, N. N75-23974
DEVIVO, C. C. N75-24185
DEVRIES, M. N75-24585
DEWINTER, F. N75-24145
DICARLO, J. A. N75-23697
DICKINSON, J. N75-23713
DICKINSON, L. G. N75-24256
DICKSON, C. R. N75-24181
DILLMAN, R. D. N75-24078
DIMMICK, R. L. N75-24294
N75-24296
DINGLE, A. N. N75-24162
DINI, D. N75-23598
DIVINE, N. N75-24607
DMITRIYEV, A. A. N75-24262
N75-24267
N75-24269
N75-24270
DODD, R. A. N75-23763
DODORICO, S. N75-24575
DOLGINOV, S. S. N75-24614
DOLLFUS, A. N75-24619
DOLOV, M. A. N75-24086
DONLAN, V. L. N75-23733
DONOVAN, F. M., JR. N75-24365
DOREY, G. N75-23706
DOUGHERTY, W. R. N75-23942
DOW, T. A. N75-23990
DOWNES, D. N75-24588
DOZER, B. E. N75-24533
DRAKE, B. N75-24064
N75-24065
DRAYSON, S. R. N75-23726
DREES, H. M. N75-23611
DRENNEN, T. G. N75-24368
DUBROVIN, V. M. N75-24625
DUBUC, J. N75-23918
DUFFY, M. T. N75-24518
DUFFY, T. E. N75-23597
DUKE, L. C. N75-24095
DUNCAN, W. R. N75-23912
DUNLAP, B. D. N75-24510
DURAND, G. N75-23917
DURAND, J. N75-24030
DURHAM, H. B. N75-24213
DURVILLE-VANDEROORD, B. J. N75-24331
DWIGHT, K., JR. N75-24504
DYACHKOV, A. V. N75-24612

E

EALY, C. D. N75-24067
EASTWOOD, C. N75-23669
EBERHARDT, L. L. N75-24425
EBERHARDT, R. G. N75-23572
EBERSOLT, M. N75-23475
ECKERT, E. R. G. N75-24157
ECKLUND, W. L. N75-24241
EDDOWES, E. E. N75-24358
EDELSTEIN, A. S. N75-24430
EDMOND, E. J. N75-23540
EDWARDS, T. R. N75-24383
EGOLF, T. A. N75-23528
EHRENFELD, J. R. N75-24199
EISENHOWER, E. H. N75-24353
EL-AASSER, M. S. N75-24011
ELLIS, C. A. N75-24402
EMERY, A. F. N75-24344
N75-24346
ENDERLIN, W. I. N75-24133
ENGLEMAN, C. N75-24390
ENGSTROM, W. L. N75-23776
EPCHTEIN, N. N75-24580
ERF, R. K. N75-23946
ERICKSON, R. C. N75-23685
ESHELBY, M. E. N75-23607
EVANS, J. C., JR. N75-24652
EVERLY, J. O. N75-23919
EWALD, B. N75-23512
EWELL, E. M. N75-24524

F

FAHRENBRUCH, A. N75-24146
FAIVRE, R. N75-24029
FALCO, C. M. N75-24494
FALCONER, D. N75-24142
FAN, L. T. N75-24194
FANNING, A. E. N75-23500
FARMER, R. C. N75-24070
FARNELL, G. W. N75-23821
FARNUM, E. H. N75-23972
FAZIO, G. G. N75-24567
FEDYANIN, V. E. N75-24272
FEENEY, R. K. N75-24444
FEGLEY, K. A. N75-24152
FEHRENKAMP, L. G. N75-23476
FENSTERMACHER, C. A. N75-23972
FENTON, D. L. N75-23471
FENYES, P. N75-23959
FERME, J. N75-24447
FERRARO, T. A., JR. N75-23736
FIAMENGO, N. A. N75-24218
FICK, A. E. N75-24323
FILATOV, A. D. N75-23823
N75-23824
FILIPCHENKO, A. N75-23646
FILZ, R. C. N75-24249
FINK, M. N75-23739
FINK, U. N75-24597
FINNERTY, A. E. N75-23803
FISCHER, W. D. N75-23873
FISHER, C. H. N75-23980
FLEISCHER, R. J. N75-24388
FLORENSKIY, K. P. N75-24622
FLUECK, J. A. N75-24349
FOKIN, V. G. N75-23631
FOLLENIUS, M. N75-24326
FONG, T. T. N75-23858
FOOTE, D. N75-24343
FORAN, D. N75-24059
FORESTIERI, A. F. N75-24109
FORREST, D. J. N75-23922
FORSHAW, S. E. N75-23564
FOSSEY, M. E. N75-23981

FOWLES, G. R. N75-23982
FRALICK, S. C. N75-23825
FRANCISC, P. N75-24661
FRANK, L. A. N75-24209
FRAZER, J. W. N75-23728
FRAZIER, T. B. N75-24010
FREDERICK, W. G. D. N75-24520
FREDERICKSON, A. R. N75-23867
FREUND, A. N75-23751
FREY, R. N75-23862
FREZELL, T. L. N75-24357
FRICK, J. K. D. N75-23481
FRIEDLANDER, M. W. N75-23927
FRIEND, G. C. N75-23997
FRIES, R. J. N75-23972
FROGEL, J. A. N75-24560
FROLOV, V. M. N75-23521
FUBARA, D. M. N75-24055
FUCHEL, K. N75-24409
FUELBERG, H. E. N75-24233
FULLAM, H. T. N75-23729
N75-24454
FULLERTON, C. M. N75-24261
FURNISS, I. N75-24565
N75-24566
FUSARO, R. L. N75-23988

G

GABOW, H. N75-24377
GADDLE, J. C. N75-24553
GAGOSZ, R. M. N75-23946
GALBURT, D. N75-23940
GALLAGHER, J. M. N75-24128
GALVAN, L., JR. N75-23977
GALVAS, M. R. N75-24116
GAMMON, R. H. N75-24574
GARDNER, J. L. N75-24438
GAREWAL, K. N75-23860
GARLOW, R. J. N75-24129
GARRETT, H. J. N75-24520
GARY, A. M. N75-24241
GASKILL, J. R. N75-23809
GAUNTNER, D. J. N75-23884
GELLES, S. H. N75-23624
GENTILE, A. L. N75-24466
GEOHRING, D. N75-24087
GEORGE, A. R. N75-23608
GERASIMOV, B. N75-23936
N75-24293
GERBER, B. N75-24142
GIBSON, R. S. N75-24300
GILG, J. F. N75-24129
GILL, P. E. N75-24421
GILLETT, J. W. N75-24200
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GILLON, G. N75-23493
GILMER, D. S. N75-24054
GIORDANO, S. N75-24512
GIOVANIELLI, D. V. N75-23972
GIULIANO, C. R. N75-24466
GIVONI, B. N75-24348
GLAHN, M. N75-23705
GLASER, P. E. N75-23683
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GLESKE, I. U. N75-23922
GLIDEWELL, R. J. N75-23500
GLOSS, B. B. N75-23514
N75-23559
GODET, M. N75-24004
GODLEWSKI, M. P. N75-24117
GODWIN, R. P. N75-23972
GOE, G. N75-24222
GOERRES, H. P. N75-24308
GOERTZ, C. K. N75-24605
GOILLOT, C. N75-24052
GOLASINSKI, J. A. N75-24143
GOLDBERG, E. N75-23853
GOLDSTEIN, J. N75-24522
N75-24543
GOLDSTEIN, L. F. N75-24467
GOLDSTEIN, S. N75-24495
GOLOVACHEV, V. N75-23936
GOLOVANOV, Y. N75-23936
N75-24654
GOLSHAN, N. N75-24204
GOODALL, R. G. N75-23568
GOODENOUGH, J. B. N75-24504
GOODWIN, C. N75-24082
GOODWIN, F. K. N75-23483
GOPALAPILLAI, S. N75-24055
GORADIA, C. N75-24108
GORCHAKOV, Y. V. N75-24645
GORELOV, S. L. N75-23898
GOROG, I. N75-24536
GORYACHEV, Y. M. N75-24519
GRANKENFELD, J. W. N75-23604
GRAY, D. D. N75-23876
GRECHNEV, K. V. N75-24616
GREEN, L. A. N75-23720
GREEN, T., III N75-24053
GREENBERG, J. M. N75-24576
N75-24584
GREENE, B. E. N75-24032
GREGORY, D. C. N75-23739
GRESZCZUK, L. B. N75-23710
GREZLAK, J. H. N75-23689
GRIESE, H. N75-23705
GRIESENAUER, N. M. N75-23624
GRIFFITHS, D. M. N75-23596
GRINGAUZ, K. I. N75-24611
GRISHIN, V. I. N75-24044
GRONHOVD, G. H. N75-24131
GROSS, F. P. N75-24547
GROSVALD, N. V. N75-23613
GROSZEK, A. J. N75-23997
GROUVEL, J. M. N75-23916
GRUDINSKOGO, P. G. N75-23856
GRUENLING, H. W. N75-23696
GRUENWALDT, H. N75-24207
GRYVNAK, D. A. N75-23956
GSCHNEIDNER, K. A., JR. N75-24450
GUALTIERI, D. M. N75-23744
GULITZ, G. N75-23806
GULL, T. R. N75-24556
N75-24559
GUO, C. J. N75-24462
GUREVICH, V. B. N75-24640
GURKO, O. V. N75-23637
GURYLEV, V. G. N75-23907
GUSEV, A. M. N75-24279
N75-24280
N75-24281
GUSEV, K. G. N75-23823
N75-23824
GUSEV, V. N. N75-23901
GUSTAFSSON, G. N75-24214
N75-24215
GUTHRIE, M. P. N75-24532
GUY, A. W. N75-24344
N75-24346
N75-24347
GUY, R. W. N75-23885
GYLDEN, N. N75-23634

H

HAAPALA, U. S. N75-24096
HABING, H. J. N75-24573
HACHMEISTER, L. E. N75-24284
HADDAD, S. P. N75-23673
HADDOCK, F. T. N75-24593
HAERENDEL, G. N75-24476
HAFETZ, L. N75-23897
HAGL, S. N75-23928
HAJELA, D. P. N75-24201
HAKKI, A. N75-24135
HALFORD, J. H. N75-24493
HALL, G. R. N75-23487
HALL, L. R. N75-23776
HALLIGAN, J. E. N75-23692
HAMMERSLEY, R. J. N75-24161
HAMMITT, F. G. N75-23895
N75-23909
N75-23958
N75-23959
HANCY, J. P. N75-24009
HANEY, D. G. N75-23535
N75-23536
N75-23537
N75-23538
HANISH, S. N75-24434
HANSEN, A. G. N75-23723
HANSON, G. F. N75-24053
HANSON, M. S. N75-24133
HARD, L. O. N75-24091
HARDY, J. M. N75-23495
HARDY, W. H., II N75-23790
HARE, T. M. N75-23792
HARGIS, P. J., JR. N75-23970
HARLOW, F. H. N75-23893
HARRIGAN, W. C., JR. N75-23715
HARRIGILL, W. T., JR. N75-23851
HARRIS, F. N75-23838
HARRIS, F. J. N75-23834
HARRIS, S. N75-24570
HARRIS, W. L. N75-23611
HART, L. N75-24572
HARTEN, R. H. N75-24571
HARTLEY, J. N. N75-24133
HARWIT, M. N75-24579
HASELL, P. G., JR. N75-24078
HAYGOOD, R. C. N75-24358
HAYWARD, R. A. N75-23953
HAYWOOD, W. J., JR. N75-24366
HECHT, T. A. N75-24180
HEDLAND, D. A. N75-23632
HEEMSKERK, J. F. N75-24001
HEFFERNAN, J. T. N75-23476
HEIDELBERG, L. J. N75-23569
HEIMANN, W. N75-23938
HELLSTEN, T. N75-24482
N75-24486
HENDERSON, J. H. N75-24240
HENDERSON, W. P. N75-23559
HENDRICKS, R. C. N75-23883
HENRY, P. H. N75-24349
HENZE, E. N75-23703
HERBETTE, G. N75-24009
HERBST, R. L. N75-24469
HERMAN, A. N75-24407
HERONEMUS, W. E. N75-24101
HERZOG, K. L. N75-23692
HESS, R. A. N75-24416
HEWITSON, V. S. N75-24535
HEXNER, G. N75-24525
HIBLER, W. D., III N75-24048
HICKEY, D. H. N75-23557
HICKS, P. A. N75-23836
HIGGINS, F. B., JR. N75-24189
HIGGINS, T. H. N75-24354
HIGH, M. D. N75-23504
HILL, B. F. N75-24523
N75-24538
HILL, J., IV N75-24200
HILL, R. A. N75-23970
HIRSCH, N. A. N75-23563
HIRTH, A. N75-23807
HJELLMING, R. M. N75-24574
HOBBS, J. R. N75-23811
HOCH, M. N75-24520
HOCKEY, B. J. N75-23794
HOECKER, W. H. N75-24181
HOEHNE, W. E. N75-23546
HOFFMAN, J. D. N75-24011
HOFFMAN, M. P. N75-23814
HOFMANN, M. A. N75-24357
HOIDALE, M. M. N75-24255
HOLADAY, B. H. N75-23628
HOLDEMAN, L. B. N75-24502
HOLLOMAN, D. R. N75-24073
HOLMES, J. F. N75-23981
HOLT, F. S. N75-23831
HOLT, S. S. N75-23924
N75-24595
N75-24596
HOLZEM, H. N75-23599
HOMYAK, L. N75-23569
HONEA, R. B. N75-24546
HONG, H. Y. P. N75-24504
HONG, S. W. N75-23879
HOOISMA, J. N75-24338
HOOKER, R. B. N75-23954
HOOKER, R. B., III N75-24463
HOOPER, J. W. N75-24444
HOPKINS, T. C. N75-24548
HORD, B. L. N75-24513
HORNG, J. T. N75-24041
HOROWITZ, J. N75-24059
HORSEWOOD, J. L. N75-23635
HOUTMAN, P. C. N75-24333
HOWLAND, R. A., JR. N75-24417
HOWLETT, J. T. N75-23556
HSI, B. P. N75-24522
N75-24543
HSIAO, J. K. N75-23835
HU, R. H. N75-23530
N75-23545
HUBBARD, D. W. N75-24184
HUCK, F. O. N75-23921
HUCK, R. W. N75-23655
HUCKABEE, M. L. N75-23792
HUDSON, D. E. N75-24223
N75-24224
N75-24225
HUDSON, H. N75-24343
HUDSON, J. F. N75-24547
HUEBENER, R. P. N75-24509
HUETTER, U. N75-23701
HUFFMAN, J. K. N75-23559
HUFFORD, G. L. N75-23943
HUGENSCHMIDT, M. N75-23808
HUMMEL, A. N75-24455
HUNT, G. R. N75-24083
HUSSEINY, A. A. N75-24453
HWANG, S. K. N75-23780
HYER, M. W. N75-24024
HYPHER, R. P. N75-23540

I

IANIUTIN, E. G. N75-24036
INNES, L. G. N75-24363
INOUYE, L. Y. N75-23679
IRODOV, R. D. N75-23527
IRWIN, G. R. N75-23774
ISAKSEN, L. N75-24139
IVANNIKOV, V. F. N75-23631
IVANOV, Y. I. N75-23560

J

JAARSMA, F. N75-23490
JACKSON, C. A. N75-24129
JACOB, R. L. N75-23981
JACOBSEN, R. A. N75-23482
JACOBSON, I. D. N75-23532
JAGERS, E. C. N75-24524
JALUFKA, N. W. N75-24477
JAMES, D. L. N75-24376
JAMET, F. N75-24009
JANSSON, L. G. N75-23762
JANTZEN, E. N75-24008
JARVINEN, A. W. N75-24200
JELESNIANSKI, C. P. N75-24288
JENKINS, W. K. N75-24370
JENNINGS, R. E. N75-24565
N75-24566
JEYAPALAN, K. N75-24091
JIN, S. N75-23780
JOHNSON, A. N75-23634
JOHNSON, C. L. N75-23579
JOHNSON, D. L. N75-24350
JOHNSON, H. H. N75-23793
JOHNSON, H. M. N75-24569
JOHNSON, R. L. N75-23942
JOHNSON, R. O. N75-23940
JOHNSON, R., JR. N75-23667
JOHNSON, T. H. N75-24480
JOHNSON, W. D. N75-23878
JOHNSON, W. S. N75-24043
JOHNSTON, A. A. N75-24018
JOHNSTON, S. C. N75-23892
JONES, B. N75-24562
JONES, D. E. N75-24626
JONES, E. B. N75-24066
JONES, H. L. N75-23654
JONES, K. L. N75-24610
JONES, K. N. N75-24317
JONES, W. L. N75-23569
JONES, W. W. N75-23975
JORDAN, R. C. N75-24157
JOSHI, A. N75-24512
JOSKOW, P. L. N75-24140
JUDD, W. A. N75-24528
JUNGHANS, R. C. N75-24183
JUNOD, T. L. N75-24319
JURGENS, R. B. N75-23827
N75-24222
JUST, J. N75-24539

K

KADMAN, Y. N75-23932
KAFALAS, J. A. N75-24504
KALAFATI, D. D. N75-24141
KALASHNIKOV, N. I. N75-24653
KALININ, G. P. N75-24263
KALSHOVEN, J. E., JR. N75-23962
KAMBER, P. W. N75-23578
KAMMERER, O. F. N75-24512
KAMOWSKI, J. C. N75-24231
KAMPWIRTH, R. T. N75-24509
KANDA, M. N75-23826
KANNEL, J. W. N75-23990
KAPLUN, V. B. N75-23613
KAPUSTIN, G. A. N75-23787
KARAS, N. V. N75-23947
KARAVAYEV, V. G. N75-23787
KARNAUKOV, G. F. N75-23613
KAROL, I. L. N75-24190
KARPOVICH, I. A. N75-24517
KARYAGIN, V. P. N75-23631
KATSANIS, T. N75-24106
KATZ, L. N75-24249
KAUFMAN, M. N75-23755
N75-23756
KAYE, G. T. N75-23871
KAZANGEY, I. N75-23945
KEARNS, J. D. N75-23799
KEBLAWI, F. S. N75-23548
KEENAN, J. C. N75-24379
KELLER, A. N75-23895
KELLER, O. A. N75-24650
KELLY, W. L. N75-23937
KELSEY, R. A. N75-23758
KEMP, C. C. N75-24103
KENDALL, E. G. N75-23715
KENNEY, J. A. S. N75-24342
KENT, G. N75-24156
KERHERVE, F. N75-23795
KERR, J. R. N75-23981
KERZHANOVICH, V. V. N75-24617
KETTLEBOROUGH, C. F. N75-23567
KHAPAYEV, M. M. N75-24281
KIEFER, C. N75-24011
KIEFER, R. W. N75-24053
KILLPATRICK, D. H. N75-23667
KIM, A. G. N75-24074
KIM, C. S. N75-23798
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KINDLE, E. C. N75-24120
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KINZLER, J. A. N75-23945
KIRCHBAUM, G. K. N75-23799
KIRSCH, W. W. N75-23548
KIRSCHSTEIN, C. N75-24379
KISH, J. N75-23895
KLAPTSOV, V. M. N75-24650
KLEINMANN, D. E. N75-23937
KLEPPE, K. H. N75-23758
KLIGE, R. K. N75-24103
KLUBOVICH, V. V. N75-23715
KNIGHT, R. D. N75-24342
KOFSKEY, M. G. N75-24156
KOGAN, M. N. N75-23795
KOHL, F. J. N75-23981
KOLIN, I. V. N75-24617
KOLOSOV, M. A. N75-23567
N75-24281
KONOVALOV, B. N75-24011
KONYVES-TOTH, P. N75-24053
KOORNNEEF, J. N75-23667
N75-24074
KORNEVA, L. A. N75-23798
KOSTIN, A. G. N75-24487
KOTOSONOV, A. S. N75-23784
KOVACS, A. N75-24120
KOVEK, J. N75-24121
KOWALL, R. J. N75-24122
KOZLOV, V. B. N75-24164
KRAMAR, P. N75-23790
KRAMAR, P. O. N75-23486
KRAMER, R. L. N75-24604
KRANTZ, D. W. N75-24093
KRASNOPOLSKIY, V. A. N75-23865
KRASOVSKIY, G. N. N75-24344
KRAUS, E. B. N75-24346
KRAUSE, C. W. N75-24347
KRAUSS, H. N75-24064
KREBS, M. J. N75-24065
KREIMER, O. N75-23949
KRENZ, G. N75-24035
KRISHNA, G. V. N75-24180
KROLICZEK, E. J. N75-23955
KRUEGER, P. N75-23695
KRUGLOV, Y. M. N75-24230
KRUSE, R. L. N75-23565
KRYSKO, A. A. N75-24298
KSANFOMALITI, L. V. N75-24470
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KUBE, W. R. N75-24557
KUHN, G. D. N75-23513
KUHNER, M. N75-23724
KULCINSKI, G. L. N75-24567
KULIKOV, K. A. N75-23566
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KULLMAN, D. N75-23721
KUNASHEV, B. S. N75-24398
KUNZE, C. N75-24512
KURT, V. G. N75-24325
KURTZ, R. L. N75-24364
KURUCZ, R. L. N75-24342
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KURZIUS, S. C. N75-24514
KUSAK, L.
KUSHMAN, K. L.
KUZMIN, R. O.
KWOK, S. P.

L

LABERGE, C. A. N75-24121
LACOUR, M. N75-24122
LADOUCE, R. J. N75-24164
LAFORSSE, J. M. N75-24566
LAI, S. N75-24211
LAJOIE, A. D. N75-24212
LAL, D. N. N75-24376
LAM, C. M. N75-23919
LAM, D. H. N75-24097
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LAMBERT, D. L. N75-23562
LAMBERT, D. W. N75-24278
LAMNECK, J. H. N75-24567
LANCASTER, M. C. N75-23480
LANCEVICH, E. J. N75-24263
LANDER, G. H. N75-23783
LANDGREBE, A. J. N75-24383
LANDOLT, E. N75-24106
LANDWEHR, C. E. N75-23898
LANE, N. E. N75-23752
LAPADULA, L. J. N75-23906
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LAPAYEV, E. V. N75-24625
LAPRIE, J. C. N75-23936
LARBALESTIER, D. C. N75-24659
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LARSON, A. R. N75-23968
LARSON, R. W. N75-24064
N75-24065
LATOUR, J. N75-24230
LAUGHREY, J. A. N75-23508
LAWN, B. R. N75-23793
N75-23796
LAY, C. M. N75-24373
LAYSSAC, J. N75-24457
LAZAR, D. P. N75-23770
LEAR, W. M. N75-24419
LEE, C. T. N75-24439
LEE, E. H. N75-24045
LEE, H. J. N75-23718
LEE, J. A. N75-24189
LEE, J. H. N75-24477
LEE, L. H. N. N75-24041
LEE, M. H. N75-23981
LEE, W. S. N75-23476
LEE, Y. C. A. N75-23611
LEHNERT, B. N75-24483
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LEHNERT, R. W. N75-23944
LEIDHEISER, H., JR. N75-24011
LEIGHTON, H. I. N75-24647
N75-24648
LEITNAKER, J. M. N75-23973
LEMKE, D. N75-24564
LEMMER, O. J. N75-23481
LENIZERHY, D. N75-23702
LEONARD, R. J. N75-24135
LEONOV, A. A. N75-23621
LEONOV, E. I. N75-24517
LERAY, J. N75-24206
LERFALD, G. M. N75-23827
N75-24222
LERNER, W. N75-24524
LESHOWITZ, B. N75-24358
LEUNG, J. K. N75-23825
LEVERICK, L. N75-23862
LEVY, G. N75-24128
N75-24121
N75-24122
N75-24164
LEVY, P. W. N75-23790
LEYNAERT, J. N75-23486
LICARI, J. J. N75-24489
LICHTIN, N. N. N75-24132
LIEBER, A. J. N75-23972
LIENTZ, B. P. N75-24410
LIFKA, B. W. N75-23758
LIGHTMAN, A. P. N75-24604
LIGON, J. T. N75-24093
LIKHOVESTKII, B. P. N75-23865
LIN, J. C. N75-24344
N75-24346
N75-24347
LISKOW, C. L. N75-24064
N75-24065
LITTLE, M. J. N75-23949
LIU, H. K. N75-24035
LIU, M. K. N75-24180
LIVANOS, A. N75-23955
LOEDEL, R. N75-23695
LOITIERE, B. N75-24230
LONG, J. W. N75-23565
LONGO, L. N75-24298
LOOMIS, J. S. N75-24470
LORENCE, L. N75-24367
LORTET-ZUCKERMANN, M. C. N75-24557
LOTTER, K. N75-23513
LOUIS, R. N75-23724
LOW, F. J. N75-24567
LOWE, R. W. N75-23566
LOWELL, C. E. N75-23761
LOWRY, J. D. N75-23721
LUCKHAM, D. C. N75-24398
LUHMAN, T. S. N75-24512
LUITSE, W. J. N75-24325
N75-24364
LURIA, S. M. N75-24342
LUTHJENS-NEIJHOFF, J. A. N75-24330
LYNN, J. J. N75-23656
LYONS, R. P. N75-24514

M

MACANALLY, R. N75-23955
MACISAAC, B. D. N75-23576
MACKAY, J. W. N75-24449
MACKENZIE, C. M. N75-23678
MACKOVCIAK, J. J. R. N75-23683
MACLEAN, S. C. N75-24443
MACPHERSON, P. B. N75-23991
MAGEE, W. N75-24142
MAGILL, J. N. N75-24129
MAGNUSON, W. G. N75-24535
MAHAJAN, V. N. N75-24433
MAIER, G. N75-24121
N75-24122
N75-24164
MAJOOR, G. D. N75-24336
MAKSIMOV, G. Y. N75-23637
MALECEK, J. N75-23561

MALEN, K. N75-23762
MALILA, W. A. N75-24062
MALKOV, Y. V. N75-24617
MALONE, T. B. N75-24359
MANDELKORN, J. N75-24112
MANERA, M. N75-24030
MANKIN, J. B. N75-24047
MANN, F. I. N75-23635
MANON, J. C. N75-24000
MANSON, J. A. N75-24011
MAPLES, M. D. N75-24385
MARBACH, H. W., JR. N75-24018
MARCINKOWSKI, M. J. N75-23769
MARCUS, B. D. N75-23880
MARCY, R. N75-23680
MARGERUM, J. D. N75-23949
MARING, G. N75-24549
MARIONNI, P. A. N75-24594
MARKS, D. H. N75-24547
MAROV, M. Y. N75-24617
MARRS, R. W. N75-24060
MARSCHALL, C. W. N75-23985
MARSHALL, S. A. N75-23551
MARSIK, S. J. N75-23668
MARTIN, C. N75-24005
MARTIN, R. L. N75-24509
MARTIN, W. E. N75-24471
MASSACHI, M. N75-23983
MASTERS, R. M. N75-24110
MASUBUCHI, K. N75-23754
MATHIEU, E. N75-24464
MATTERN, I. E. N75-24332
N75-24333
MATTHIAS, A. D. N75-23726
MAUGIS, D. N75-24002
MAULDING, S. E. N75-24516
MAVRIN, V. I. N75-23613
MAWHINNEY, W. N75-23522
MAYER, G. N75-23795
MAYER, V. F. N75-23746
MAYNARD, O. E. N75-23683
MAZELSKY, B. N75-23541
MCANELLY, W. B. N75-23675
MCCALL, G. H. N75-23972
MCCARTY, J. L. N75-23555
MCCONATHY, D. R., JR. N75-24252
MCCOY, P. F. N75-24399
MCCRICKERD, J. T. N75-23952
MCDONALD, G. E. N75-23753
N75-23989
MCDONALD, R. C. N75-24163
MCFARLAND, D. R. N75-24477
MCFARLAND, M. J. N75-24228
MCGEE, T. J. N75-23978
MCGOWAN, J. G. N75-24134
MCGUINNESS, J. N75-24368
MCINTURFF, A. D. N75-24511
MCKAY, C. L. N75-24342
MCKELVIE, J. N75-23948
MCLAUGHLIN, P. V., JR. N75-23716
MCMAHAN, A. K. N75-24503
MCMAHON, D. J. N75-24366
MCMASTERS, O. D. N75-24450
MCMILLIN, L. M. N75-24260
MCPHEE, M. G. N75-24049
MCPHERSON, D. A. N75-24444
MEARS, T. W. N75-23941
MEDVEDEV, M. M. N75-24423
MEETER, E. N75-24338
MEHMI, A. N75-24545
MEIER, G. E. A. N75-23516
MEINEL, A. B. N75-24100
MEINEL, M. P. N75-24100
MEISNER, H. N75-23928
MELEASON, E. T. N75-23602
MELVILLE, J. G. N75-24626
MENDENHALL, M. R. N75-23483
MEREAU, P. M. N75-24414
MERIFIELD, P. M. N75-24057
MERKINE, L. O. N75-23874
MERKULOV, B. L. N75-23525
MERRILL, W. C. N75-23573
MESSIER, D. R. N75-23791
MESSMER, K. N75-23928
MEULING, W. J. A. N75-24334
MEYER, G. N75-23606
MEZHIROV, I. I. N75-23517
MICHAELIS, R. E. N75-23941
MICKENS, R. E. N75-24445
MICOCCI, A. N75-24359
MIKIELEWICZ, J. N75-23958
MIKUTEIT, S. N75-23868
MILAM, M. D. N75-23666
MILANO, M. J. N75-23913
MILES, A. T. N75-23600
MILLER, T. J. N75-24412
MILLS, R. L. N75-23788
MINAILOS, A. N. N75-23902
MINER, R. V., JR. N75-23761
MINEYEV, V. A. N75-24645
MIODUSHEVSKII, P. V. N75-23520
MISHLER, H. W. N75-23986
MITCHELL, K. N75-24146
MITCHELL, T. R. N75-24408
MOAK, D. P. N75-23624
MOCCARI, A. N75-23748
MODIG, C.
MOLCHANOV, N. S.
MOLENAAR, P. C.
MOLENAT, J.
MONTGOMERY, M. D.
MOORE, B. R.
MOORWOOD, A. F. M.
MORELAND, M. K.
MORGAN, L. A.
MORGENSTERN, J. P.
MORINO, L.
MOROZ, V. I.
MOROZOV, S. F.
MORRIS, J.
MORRIS, J. W., JR.
MORRIS, L. D.
MORRON, B. G.
MORSE, F. H.
MOSES, M. A.
MOULDEN, T. H.
MOURAD, A. G.
MUELLER, R. F.
MULLANEY, G. J.
MULVILLE, D. R.
MUNDELL, A. R. G.
MUNIS, R. H.
MUNNIKSMA, B.
MURACA, R. J.
MURAKI, T.
MURPHY, A. H.
MURPHY, M. M.
MURRAY, W.
MUSANOV, S. V.
MUYDERMAN, E. A.
MYERS, I. T.

N

NADZHIP, A. E. N75-24613
NAJAKA, R. S. N75-24129
NALEPKA, R. F. N75-24062
NARAYEVA, M. K. N75-24623
NARDONE, V. N75-23577
NAVE, R. L. N75-24356
NEETHLING, A. J. N75-23730
NEIL, H. F., JR. N75-24528
NELSON, L. Y. N75-23980
NESCI, R. N75-24558
NESS, N. F. N75-24642
NETTLES, M. E. N75-24080
NEUGEBAUER, G. N75-24561
NEW, E. F. N75-23839
NEWBERG, R. T. N75-24468
NEWIRTH, R. N75-24189
NEWMAN, B. A. N75-23848
NEWMAN, L. N75-24255
NI, R. H. R. N75-23474
NICHOLS, L. D. N75-23891
NICKERSON, G. R. N75-23687
NIELSEN, J. M. N75-24328
NIELSON, D. L. N75-24553
NIEMANN, B. J., JR. N75-24053
NIKOLAEV, A. G. N75-23828
N75-23830
NIKOLAYENKO, L. V. N75-23631
NIKOSKII, Y. V. N75-23901
NIXON, C. W. N75-24350
NOISEUX, D. U. N75-23932
NOISEUX, N. B. N75-23932
NORRGARD, K. N75-23762
NORTH, E. R. N75-23948
NORTHRUP, R. F. N75-24032
NOSKOWITZ, D. N75-23532
NOYES, R. W. N75-24567
NUNN, R. H. N75-23523
NUTT, R. P. N75-24357
NYE, S. N75-23595

O

OBERHOLZ, H. N75-24297
OBRIEN, H. W. N75-24085
OBRIEN, T. N. N75-24091
OCONNOR, P. J. N75-24309
OESTBERG, G. N75-23762
OHARA, J. B. N75-24127
OHARE, J. E. N75-23615
OLDEHOEFT, A. E. N75-24378
OLDRIEVE, R. E. N75-23760
OLIVIER, R. N75-23757
OLSEN, C. B. N75-24522
N75-24543
OLSEN, S. W. N75-23564
OLTHOF, H. N75-24586
ONEILL, E. C. N75-23540
ONEILL, R. V. N75-24047
OPMEER, C. H. J. M. N75-24302
OPPENHEIMER, E. P. N75-24413
ORDIN, P. M. N75-23688
ORESHKIN, V. P. N75-24624
ORLOV, V. M. N75-24517
ORME, A. R. N75-24084
ORR, D. G. N75-24088
OTTO, G. H. N75-23759
OUTCALT, S. I. N75-24082
OVERALL, J. W. N75-24232
OWEN, M. J. N75-23699
OZEROV, L. N. N75-24616

P

PABIOT, J. N75-23704
PADWA, S. L. N75-24409
PAINTER, G. W. N75-23568
PALITTI, F. N75-24314
PALMOUR, H., III N75-23792
PALUDAN, C. T. N. N75-24546
PANAGIA, N. N75-24577
PANNEKOEK, H. N75-24311
PAOLUCCI, G. N75-24303
PAPADOPOULOS, K. N75-24488
PAPPIS, J. N75-24468
PARFENTYEV, N. A. N75-24620
PARIS, P. J. N75-24481
PARKER, E. R. N75-23768
PARKER, H. W. N75-23692
PARKER, R. J. N75-23990
PARKINSON, S. R. N75-24358
PASCHMANN, G. N75-24207
PASHINTSEV, V. I. N75-23641
PATAKI, G. N75-24658
PATEL, V. L. N75-24208
PATERSON, M. C. N75-24332
PATIL, S. S. N75-24374
PATRIARCHI, P. N75-24581
PAULLIN, R. L. N75-23618
PAULSON, H. M. N75-24342
PAULUS, T. J. N75-23845
PAVLENKO, V. A. N75-23929
N75-24616
PEARSON, R. K. N75-23969
PECSVARADI, T. N75-23549
PEDLAR, A. N75-24572
N75-24589
PEDRONI, P. L. N75-24498
PEIKERT, J. N75-23589
PELLE, W. J., JR. N75-24182
PENMAN, J. N75-24562
PEOPLES, J. A. N75-24544
PERIGORD, M. N75-24506
PERINOTTO, M. N75-24581
PERKIN, S. C., JR. N75-23483
PERKS, M. P. N75-23585
PERSSON, S. E. N75-24560
PERTSOV, S. V. N75-23828
N75-23830
PERVIER, J. W. N75-24189
PESCHON, J. N75-24139
PETROSIAN, V. N75-24578
PETROV, I. I. N75-23737
PETROVA, G. N. N75-23856
PETROZZI, M. T. N75-23666
PETTERSON, K. N75-23762
PEYTREMANN, E. N75-24599
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N75-24601
PFAU, B. N75-23928
PHEANIS, D. C. N75-24381
PILLSTICKER, M. N75-24479
PILTCH, M. S. N75-23971
PINCKNEY, S. Z. N75-23885
PINDROH, A. L. N75-23980
PINES, S. N75-23635
PISARENKO, N. F. N75-24645
PITTS, F. H. N75-24070
PIVA, R. N75-23494
PIVOVAROV, A. A. N75-24277
PLAKIDA, N. M. N75-24432
PLANGSIRI, B. N75-24401
PLAY, D. N75-24004
PODOLSKII, V. V. N75-24517
POEHLEIN, G. W. N75-24011
POELAERT, D. H. L. N75-23670
POKROVSKIY, A. N75-23936
POLAK, A. N75-23905
POLAK, R. L. N75-24339
POLGER, P. D. N75-24259
POLTI, J. L. N75-23626
POLYAKHOVA, Y. N. N75-23633
POLYANSKII, O. Y. N75-23904
POUBEAU, P. N75-24007
POUWKLS, P. H. N75-24311
N75-24312
N75-24313
POWELL, F. X. N75-23978
POWELL, R. D. N75-23596
PRACHUKTAM, S. N75-24020

PREVENDER, T. S. N75-23996
PRINSENBERG, S. J. N75-24284
PROZOROV, N. I. N75-23613
PRUE, D. A. N75-23580
PYRKIN, Y. G. N75-24281

Q

QUERMANN, J. K. N75-23492
QUINTIERE, J. N75-23742

R

RABE, K. M. N75-24286
RABINOVICH, V. A. N75-23738
RALPH, E. I. N75-23683
RALPH, E. L. N75-24098
RAMACCI, C. A. N75-24304
RAMATY, R. N75-24646
RAMSEY, J. W. N75-24157
RANGO, A. N75-24072
RAO, J. B. L. N75-23835
RAO, M. S. M. N75-23694
REED, W. H., III N75-23610
REED, W. P. N75-23941
REESE, E. N75-24639
REID, F. A. N75-24551
REID, J. N75-23498
REMIZOV, A. P. N75-24611
RENARD, F. M. N75-24456
N75-24457
N75-24458
RENDLEMAN, R. A. N75-24064
N75-24065
REVAY, A. W., JR. N75-23530
N75-23545
REVERCOMB, H. E. N75-23920
RHABOV, I. V. N75-23737
RICHARDS, H., JR. N75-24378
RICHARDSON, R. W. N75-24478
RICHER, I. N75-23829
RICHEY, G. K. N75-23508
RINGER, H. N. N75-24105
RIPOLL, J. C. N75-23577
RIPPEE, S. N. N75-24127
ROBERT, K. N75-23900
ROBERTS, R. N75-23774
ROBERTS, R. M. N75-23960
ROBINSON, C. E. N75-23504
ROBINSON, J. M. N75-24185
ROBINSON, K. N75-23587
RODEMAN, R. N75-24022
ROEKMOJOTO, R. N75-23480
ROEMER, G. B. N75-24320
ROGACHEV, V. N. N75-24618
ROGERS, R. C. N75-23885
ROHLING, W. J. N75-23505
ROHY, D. A. N75-23597
ROLL, J. P. N75-24318
ROMANOV, R. S. N75-23631
ROMANOV, S. A. N75-24606
RONDEAU, R. E. N75-23733
ROPE, E. L. N75-23953
ROSEN, B. W. N75-23716
ROSENBAUER, H. N75-24207
ROSSETTI, C. N75-24052
ROSSOW, V. J. N75-23479
N75-23481
ROTA, P. N75-24304
ROTH, K. A. N75-23639
ROTH, M. N75-24205
ROTH, S. N75-23703
ROTHSCHILD, R. E. N75-24595
ROUCHON, J. N75-23708
ROUSSEL, M. N75-24005
ROWLEY, J. K. N75-24442
ROZHDESTVENSKIY, M. K. N75-23631
N75-24617
RUCK, G. T. N75-23919
RUSANOV, I. B. N75-23822
N75-23854
RUSEK, P. R. N75-24432
RUSH, M. N75-24522
N75-24543
RUST, B. W. N75-24047
N75-24592
RYABOV, O. L. N75-24617
RYDER, M. O. N75-23939
RYSKIEWICH, B. S. N75-23897

S

SABA, J. L. R. N75-24595
SABRI, Z. A. N75-24453
SACKETT, S. J. N75-23789
SAFLEKOS, N. A. N75-24209
SAILLEAU, J. N75-24005
SAISSY, A. N75-24465
SALISBURY, J. W. N75-24083
SAM, C. L. N75-23964
SAMMONDS, R. I. N75-23515
SAMOVOL, V. A. N75-24625
SAMOZNAYEV, L. N. N75-24625
SAMSON, J. A. R. N75-24438
SANLORENZO, E. A. N75-24354
SANTOCHI, M. N75-23598
SARAVANAMUTTOO, H. I. H. N75-23576
SARGENT, R. G. N75-24537
SATER, B. L. N75-24108
SAUNDERS, M., A. N75-24421
SAVARENSKII, E. F. N75-24220
SAVENKO, I. A. N75-24645
SAVICH, N. A. N75-24625
SAVU, A. N75-24661
SCARDINA, J. A. N75-23548
SCHAEDLA, W. N75-23862
SCHAIBLY, J. N75-24247
N75-24248
SCHALLER, W. N75-24384
SCHELLING, H. N75-23701
SCHIBLITZKI, H. J. N75-23750
SCHMID, P. E. N75-23656
SCHMIDT, S. F. N75-23543
SCHOOR, W. P. N75-24200
SCHOPKE, N. N75-24207
SCHROCK, V. E. N75-24149
SCHROEDER, J. B. N75-24467
SCHUCH, A. F. N75-23788
SCHUCKLER, H. J. N75-23803
SCHULZ, G. N75-23509
SCHUMACHER, L. L. N75-23910
SCHUMANN, L. F. N75-24106
SCHUMBURG, N. F. N75-24409
SCHUTZ, D. N75-24033
SCHWIND, R. G. N75-23481
SCOGGINS, J. R. N75-24232
N75-24233
SCOTLAND, R. L. N75-23496
SCOTT, D. N75-23999
SEBENNE, C. N75-24013
SEINER, J. M. N75-23872
SEIRANYAN, A. P. N75-24046
SEKERZH-ZENKOVICH, Y. I. N75-24275
SELIVANOV, A. S. N75-24623
SELLERS, J. N75-23593
SERAPHIN, B. O. N75-24137
N75-24150
SERLEMITSOS, P. J. N75-24595
SETTLE, G. L. N75-24383
SEUNG, S. H. N75-24576
N75-24584
SEVERDENKO, V. P. N75-23783
SEWARD, R. W. N75-23941
SHAFEY, N. A. H. N75-24428
SHAH, K. R. N75-24070
SHAH, R. C. N75 23776
SHAREFKIN, M. N75-24541
SHARMA, K. J. N75-24128
SHCHERBOVSKIY, B. Y. N75-24645
SHEAFOR, S. J. N75-23846
SHEPHERD, R. A. N75-24553
SHERWOOD, W. A. N75-24609
SHIEH, S. T. N75-23815
SHKIRINA, V. I. N75-23631
SHORT, M. R. N75-24092
SHUCHMAN, R. A. N75-24064
N75-24065
SHUGART, H. H. N75-24047
SHUMILOV, A. V. N75-24265
N75-24268
SHUROVA, M. S. N75-24267
SHUTOV, M. D. N75-23929
SIDORENKO, A. I. N75-24625
SIEBENECK, H. J. N75-24472
SIH, G. C. N75-23717
SILVESTRI, G. J., JR. N75-24148
SIMON, F. N75-24118
SIMON, F. F. N75-24111
SIMON, M. N75-24582
SIMON, M. N. N75-24582
SIMONEAU, R. J. N75-23883
SIMONETT, D. S. N75-24087
SIMONIS, E. A. N75-23585
SINELNIKOVA, I. F. N75-24623
SINNAMON, J. F. N75-24554
SIOMKAJLO, J. M. N75-24260
SIPE, E. L. N75-23951
SIVEWRIGHT, J. J. P. N75-23948
SKAKHOV, A. N. N75-23613
SKLYANKIN, V. A. N75-24612
SLAAF, D. W. N75-24338
SLATTERY, J. E. N75-24467
SLAUGHTER, M. D. N75-23961
SLETTEN, C. J. N75-23831
SLUTSKIY, M. Y. N75-24616
SMIRNOV, A. S. N75-24612
SMIRNOV, V. N. N75-24606
SMITH, E. J. N75-23833
SMITH, L. H. N75-23523
SMITH, R. V. N75-23937
SMOAK, R. H. N75-23984
SNELLEN, H. N75-24322
SNOW, A. C. N75-24357
SOBOLEV, S. L. N75-24430
SODERSTRAND, M. A. N75-24372
SOEDE, M. N75-24355
N75-24364
SOKOLOV, S. S. N75-23631
SONENSHINE, D. N75-24120
N75-24121
N75-24122
N75-24164
SOPOLEV, A. P. N75-23823
N75-23824
SORKINA, A. I. N75-24264
N75-24266
SOSNOVYY, N. V. N75-24274
SPAIN, J. D. N75-24184
SPALVINS, T. N75-24507
SPANGLER, S. B. N75-23483
SPANN, G. W. N75-24069
SPARROW, E. M. N75-24157
SPAVIERI, F. N75-24299
SPAULDING, M. N75-24290
SPENKE, E. N75-23850
SPIEWAK, I. N75-24126
SPIKES, H. A. N75-23994
SPINDT, R. S. N75-24195
SPRING, D. J. N75-23499
SPRINGER, R. J. N75-23617
SPROWLS, D. O. N75-23758
SROMOVSKY, L. A. N75-23920
STAFFORD, D. B. N75-24080
N75-24093
STALLARD, B. N75-23863
STAMPERIUS, P. C. N75-24167
STAMULIS, A. N75-23734
N75-23950
STANEV, N. N75-24656
STASSEN, H. G. N75-24325
N75-24355
N75-24364
STEARNS, S. D. N75-24213
STEBBINGS, D. W. N75-23818
STECHER, T. P. N75-24594
STEDMAN, D. H. N75-24162
STEEN, J. A. N75-24317
STEHN, J. L. N75-23616
STENZEL, R. L. N75-24487
STEPANENKO, A. V. N75-23783
STEPHENS, M. M. N75-24143
STEPHENSON, J. E. N75-23844
STERN, J. E. N75-23852
STETSON, K. A. N75-23946
STEVENS, W. F. N75-24338
STIEGLER, J. O. N75-23973
STOCKMAN, R. H. N75-24287
STOISITS, R. N75-24011
STOLARSKI, R. S. N75-24162
STOMIN, V. G. N75-24616
STONE, M. V. N75-23547
STOTTS, L. B. N75-24471
STRAND, O. N. N75-24406
STRATTON, T. F. N75-23972
STRAUSS, M. S. N75-24342
STREET, P. G. N75-23574
STRIKE, W. T. N75-23615
STRONG, A. L. N75-24138
STRONGIN, M. N75-24512
STROUD, C. W. N75-23881
STUBBS, S. M. N75-23555
STURGES, J. W. N75-24416
SUBE, R. M. N75-23493
SUCHARD, S. N. N75-23977
SUCIU, E. N75-23477
SUKHANOV, V. B. N75-24295
SULLIVAN, J. E. N75-24391
SUN, R. Y. N75-24496
SUOMI, V. E. N75-23920
SURATKAR, P. T. N75-24027
SURBER, L. E. N75-23508
SURINOV, Y. A. N75-24271
N75-24272
N75-24274
SUTTON, D. G. N75-23977
SUTTON, J. F. N75-23852
SUVOROV, B. A. N75-24623
SVISTOVA, Y. A. N75-23787
SWANSON, C. N75-24290
SWANSON, R. L. N75-24291
SWANSON, R. M. N75-23859
SWARTZ, W. A. N75-24189
SWEAZY, R. M. N75-23692
SWIATECKI, W. J. N75-24451
SWINEHART, P. R. N75-24497
SWYLER, K. J. N75-23790
SZUKSZTA, L. N75-23870

T

TABOR, D. N75-23998
TALLAMRAJU, R. K. N75-23726
TALLERCHIK, B. A. N75-24508
TAYLOR, A. D. N75-24288
TAYLOR, D. M. N75-24362
TAYLOR, E. J. N75-23921
TAYLOR, E. M. N75-24345
TAYLOR, E. W. N75-23819
TAYLOR, F. J. N75-24415
TAYLOR, R. E. N75-23718
TAYLOR, W. F. N75-23604
TEEPLE, R. V. N75-24127

TEGART, J. R. N75-23888
TEIMER, W. N75-23673
TEMPLETON, W. L. N75-23615
TEOFILO, V. L. N75-24474
TEREN, F. N75-23593
TERUKOV, E. I. N75-24508
TERVO, W. K. N75-23583
TESCHNER, C. G. N75-24229
TEWARI, S. N. N75-23743
THOMCHICK, J. A. N75-24437
THOMPSON, D. E. N75-23963
THOMPSON, D. S. N75-23775
THOMPSON, E. B., JR. N75-23690
THOMPSON, E. R. N75-23504
THOMPSON, J. S. N75-24467
THOMSON, F. J. N75-24078
THORMEYER, C. D. N75-24252
THORNLEY, S. A. M. N75-23488
THOWSEN, A. N75-24418
TIELKING, J. T. N75-24554
TIEWTRANON, P. N75-23554
TIKHONRAVOV, M. K. N75-23637
TIMM, E. E. N75-23909
TIMOFEYEVA, T. A. N75-23517
TIMOFEYEVA, T. S. N75-24624
TIMOFEYEVA, V. A. N75-24273
TOMAN, J. N75-24452
TOMLIN, J. A. N75-24399
TORRENCE, A. A. N75-23995
TRAINOR, J. H. N75-24643
TRAXLER, R. W. N75-24191
TREHAN, V. N75-24537
TRICOLES, G. N75-23953
TRIFUNAC, M. D. N75-24224
N75-24225
TRINGALI, J. M. N75-23583
TROGOLO, C. N75-24446
TRUSOV, B. P. N75-24624
TSVETKOV, V. N. N75-24616
TUGAZAKOV, R. Y. N75-23519
TUNNAH, B. G. N75-24135
TURMAN, B. N. N75-24459
TYAPKIN, V. G. N75-23613
TYSON, R. W. N75-23890

U

UDALOV, Y. F. N75-24327
UHLIG, H. H. N75-23778
UHLMANN, W. N75-24411
UKRAINTSEV, G. V. N75-23521
UNGER, R. F. N75-23777
UNTERSTELLER, L. P. N75-23475

V

V.HENKE, F. W. N75-24398
VAKULOV, P. V. N75-24645
VANDEPUTTE, P. N75-24341
VANDERGRAFT, J. S. N75-24426
VANDERHOFF, J. W. N75-24011
VANDERKOLK, R. J. N75-23566
VANDERPOORTEN, H. N75-23757
VANDERVET, W. J. N75-24016
N75-24017
VANDIETEN, J. S. M. J. N75-24355
VANDONGEN, R. H. N75-24167
N75-24168
VANDORP, B. N75-24314
VANECK, P. N75-24330
VANHEMMEN, J. J. N75-24334
VANLAN, V. N75-24277
VANLEEUWEN, D. N75-24422
VANROTTERDAM, J. N75-24312
N75-24313
VANSLUIS, C. A. N75-24332
VANTHIEL, M. N75-24513
VANTVEER, M. B. N75-24336
VARATHARAJULU, V. N75-24460
VARMAZIS, C. N75-24512
VARNER, M. O. N75-23614
VASILYEV, M. B. N75-24625
VATSA, V. N. N75-23905
VAUGHN, G. L. N75-23817
VAYSBERG, O. L. N75-24606
VEILEX N75-24500
VEILEX, M. N75-23917
VENTTSEL, M. D. N75-24324
VERHEIJ, W. S. D. N75-24335
VERIGIN, M. I. N75-24611
VERMILLION, C. H. N75-24231
VERNER, S. S. N75-24178
VERNOV, S. N. N75-24645
VICKERS, R. J. N75-23595
VIEHWEGER, G. N75-23509
VIGNERON, F. N75-24034
VIHN, T. N75-23702
VILLARET, Y. N75-23749
VINCENT, S. N75-24608
VINGRADOV, V. A. N75-24624
VINK, J. H. N75-23810
VIOTTI, R. N75-24558
VISWANATH, P. R. N75-24651
VOLKOVITSKII, O. A. N75-24250
VORONTSOV, V. I. N75-23966
VORONTSOV, V. L. N75-23967
VOSKRESENSKIY, A. D. N75-24324
VRABLE, D. L. N75-23877
VREEBURG, J. P. B. N75-24001
VRHEL, J. N75-23561
VVOLOGDIN, N. I. N75-24645
VYSHLOV, A. S. N75-24625
VYSOTSKII, V. I. N75-23966
N75-23967

W

WACHS, T. N75-24092
WAGGONER, R. C. N75-23733
WAGNER, R. J. N75-24023
WAGNER, T. W. N75-24078
WAHAB, R. N75-23810
WAHLBERG, C. N75-24484
WAID, R. L. N75-23896
WALDROP, W. R. N75-24070
WALKER, C. A. N75-23948
WALKER, J. L. N75-23542
WALKER, M. E. N75-24528
WALKER, R. E. N75-23572
WALKER, S. C. N75-23503
WALL, S. D. N75-23921
WALSHAK, L. G. N75-23866
WALTER, R. A. N75-23811
WALTHER, G. H. N75-24528
WANG, C. C. N75-24518
WANG, K. H. N75-23894
WANG, W. Y. D. N75-24429
WARE, W. A. N75-23997
WARK, D. Q. N75-24260
WARMAN, J. N75-24455
WARWICK, M. N75-23997
WASSON, R. A., JR. N75-24192
WATERS, J. H. N75-23586
WATERS, J. P. N75-23946
WAYNE, L. G. N75-24197
WEBELER, R. W. H. N75-24440
WEEKS, W. F. N75-24048
WEHNER, G. K. N75-24157
WEIDER, J. R. N75-24067
WEINBERG, I. N75-24505
WEISBROD, S. N75-23836
WEISBURD, M. N75-24197
WEISS, H. M. N75-23533
WEISS, M. F. N75-24400
WEIZER, V. G. N75-24014
WELLER, G. N75-24082
WENTZ, W. H., JR. N75-23484
WERBOWETZKI, A. N75-24260
WERLE, M. J. N75-23905
WERT, J. A. N75-23766
WESTWATER, E. R. N75-24406
WHANG, J. S. N75-24160
WHITE, C. G. N75-23581
WHITE, D. E. N75-24397
WHITNEY, D. C. N75-24180
WHITWORTH, A. P. N75-24583
WICKINS, R. L. N75-23735
WIDNALL, S. E. N75-23611
WIEDEMANN, J. N75-23705
WIEDERHORN, S. M. N75-23793
WIEGAND, C. L. N75-24058
WIGGINS, J. H. N75-24436
WIGHTMAN, J. P. N75-24441
WIJFFELMAN, C. N75-24341
WIJNANS, M. N75-24330
WILCOX, F. A. N75-23506
WILKES, G. L. N75-23689
N75-23796
WILLIAMS, T. L. N75-24373
WILLMER, A. C. N75-23496
WILSON, D. G. N75-24547
WILSON, J. T. N75-23472
WILSON, S. K. N75-24261
WINTER, N. W. N75-24218
WITHROW, S. P. N75-23731
WOHLBERG, D. B. N75-23821
WOLFE, R. R. N75-23620
WOLFSON, G. N75-23566
WOLOCHOW, H. N75-24294
N75-24296
WOLTHUIS, O. L. N75-24337
WOLVERTON, B. C. N75-24163
WONG, A. Y. N75-24487
WONG, M. S. N75-23832
WOOL, R. P. N75-23786
WOOLEY, M. L. N75-23842
WOOLLETT, R. R. N75-23602
WRIGHT, E. L. N75-24567
WRIGHT, J. J. N75-23682
WRIGHT, J. W. N75-23552
WU, E. M. N75-23700
WU, J. M. N75-23499
WYMAN, C. L. N75-23914
WYMER, D. G. N75-23992

Y

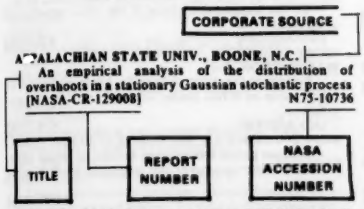
YAGER, T. J. N75-23555
YAKOVLEV, O. I. N75-24624
YAKOVLEVA, G. D. N75-24624
YAO, A. C. C. N75-23855
YAO, F. F. N75-23855
YAO, S. B. N75-24529
YAO, S. C. N75-24149
YARMOLA, T. M. N75-24519
YARNELL, J. L. N75-23788
YASUDA, H. N75-23797
YATSUNSKIY, I. M. N75-23637
YAZVITSKIY, G. A. N75-23636
YEFIMOV, A. I. N75-24624
YEH, F. C. N75-23884
YEN, B. T. N75-23774
YEROSHENKO, Y. G. N75-24614
YILMAZ, E. N75-23895
N75-23915
YING, R. S. N75-23858
YODER, S. M. N75-24548
YOSHIKAWA, T. N75-23925
YOUNG, C. W., JR. N75-23864
YOUNG, L. L. N75-23566
YUDIN, I. N75-23622
YUSHIN, A. Y. N75-23524
YUSKA, J. A. N75-23570

Z

ZAALBERG, O. B. N75-24336
ZACKAY, V. F. N75-23768
ZADOR, E. N75-24455
ZALIKHANOV, M. C. N75-24086
ZAMULA, G. N. N75-23520
N75-24042
ZEILIK, M., II N75-24567
ZENDELL, A. N75-24608
ZHELEZNOV, N. N75-23936
ZHELNIN, Y. N. N75-23640
ZHURAVLEV, G. I. N75-23781
ZHUZGOV, L. N. N75-24614
ZINKHAM, R. E. N75-23775
ZIPFEL, P. H. N75-23642
ZIPPER, J. J. N75-24380
ZUBECK, R.B. N75-24509

CORPORATE SOURCE INDEX

TYPICAL CORPORATE SOURCE INDEX LISTING


CORPORATE SOURCE
APPALACHIAN STATE UNIV., BOONE, N.C.
An empirical analysis of the distribution of overshoots in a stationary Gaussian stochastic process
[NASA-CR-129008] N75-10736
TITLE
REPORT NUMBER
NASA ACCESSION NUMBER

Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ABCOR, INC., CAMBRIDGE, MASS.
Analysis of the composition of the atmosphere in the Los Angeles Basin
[PB-239466/6] N75-24199

ADVANCED RESEARCH PROJECTS AGENCY, ARLINGTON, VA.
Ocean engineering
[AD-A007297] N75-23812

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS (FRANCE).
Airframe/propulsion interference
[AGARD-CP-150] N75-23485
Power plant controls for aero-gas turbine engines
[AGARD-CP-151] N75-23575
Specialists meeting on Failure Modes of Composite Materials with Organic Matrices and Their Consequences on Design
[AGARD-CP-163] N75-23698
Medical requirements and examination procedures in relation to the tasks of today's aircrew: Comparison of examination techniques in neurology, psychiatry and psychology with special emphasis on objective methods and assessment criteria
[AGARD-CP-153] N75-24297
Test for quick and early detection of psychic syndromes more frequent in the Air Force personnel N75-24298
Administration of the Rorschach tests to a sample of student pilots training apprenticeship N75-24299

AEL SERVICE CORP., FARMINGDALE, N.J.
Electromagnetic interference specification limits for air route traffic control centers
[AD-A008926] N75-23547

AEROJET LIQUID ROCKET CO., SACRAMENTO, CALIF.
Multiple jet study data correlations
[NASA-CR-134795] N75-23572

AEROJET NUCLEAR CO., IDAHO FALLS, IDAHO.
Thermal neutron filter cadmium electroplate properties
[ANCR-1189] N75-23711

AEROJET SOLID PROPULSION CO., SACRAMENTO, CALIF.
Non-linear fracture mechanics: New theories of solid propellant response and fracture behaviors
[AD-A007334] N75-23800

AERONAUTICAL QUALITY ASSURANCE DIRECTORATE, UXBRIDGE (ENGLAND).
An investigation of the effect of shot peening on the rotating bending fatigue endurance of chromium plated 18% Ni maraging steel
[AQD/U-000667] N75-23773

AERONAUTICAL SYSTEMS DIV., WRIGHT-PATTERSON AFB, OHIO.
The state of the art in oil quality gaging on US military and commercial aircraft
[AD-A007682] N75-23565

AEROSPACE CORP., EL SEGUNDO, CALIF.
Manned systems utilization anaylsis. Study 2.1: Space servicing pilot program study
[NASA-CR-142758] N75-23620
Mechanical properties of aluminum alloy-graphite fiber composites
[AD-A007779] N75-23715
Reaction rates and energy distributions among reaction products for the H plus Cl2 and Cl plus H2 reactions
[AD-A007782] N75-23735
A technique for determining the accuracy of an incremental shaft encoder
[AD-A007781] N75-23945
New laser oscillation in the oxygen atom
[AD-A007780] N75-23977
Determination of the stress-optic coefficients of Zn Se
[AD-A007778] N75-24467

AEROSPACE CORP., LOS ANGELES, CALIF.
Atmospheric phenomena
[AD-A007792] N75-24218

AEROSPACE DEFENSE COMMAND, ENT AFB, COLO.
Aerospace Defense Command Weapon System Evaluation Program plan [WSEP]
[AD-A007690] N75-24665

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Human temporary threshold shift and recovery from 24 hour acoustic exposures
[AD-A007842] N75-24350

AEROSPACE RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Temperature dependence of particulate erosion
[AD-A007841] N75-24459

AGRICULTURAL RESEARCH SERVICE., WESLACO, TEX.
Irrigation scheduling, freeze warning and soil salinity detecting
[E75-10285] N75-24058

AIR FORCE AERO PROPULSION LAB., WRIGHT-PATTERSON AFB, OHIO.
Twin jet exhaust system test techniques N75-23500
Parametric analysis of an advanced manned interceptor utilization
[AD-A007663] N75-23563
The role of computers in future propulsion controls N75-23582
High temperature tests of a JP-5 type fuel
[AD-A007662] N75-23603
Practical stability of a reluctance synchronous machine
[AD-A007659] N75-23605

AIR FORCE ARMAMENT LAB., EGLIN AFB, FLA.
Invariant dynamics of flight vehicles under rotating reference frames
[AD-A007671] N75-23642

AIR FORCE CAMBRIDGE RESEARCH LABS., L. G. HANSCOM FIELD, MASS.
Caustic matching: A new technique for improving limited-scan antennas
[AD-A007665] N75-23831
Ray-tracing simulation of swept-frequency backscatter ionograms
[AD-A007686] N75-23832
Radiation pattern, reactive power, and resistive aperture antennas
[AD-A007675] N75-23840
Radiation induced electrical current and voltage in dielectric structures
[AD-A007670] N75-23867
Laboratory and flight results of the microstrip plasma probe
[AD-A007685] N75-23947
Mid-infrared spectral behavior of igneous rocks
[AD-A007680] N75-24083
An analysis of imperfections in DMSP photographs caused by high energy solar and trapped protons
[AD-A007679] N75-24249

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
Airframe/propulsion system flow field interference and the effect on air intake and exhaust nozzle performance N75-23508
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TIMAVI: A computer program to time-average repetitively scanned digitized spectra
[AD-A007849] N75-23733
Magnetic properties of neodymium-samarium-cobalt alloys
[AD-A007848] N75-24520

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Experimental study of the axisymmetric shaped hypersonic nozzles
[AD-A007471] N75-23517
Account of shearing strain during the calculation of the oscillations of low aspect-ratio wing by the method of polynomials
[AD-A007397] N75-23518
Interaction of shock wave with wedge, which moves at supersonic speed
[AD-A007302] N75-23519
Reproduction of the interaction of aerodynamic loads and structural distortions during strength tests
[AD-A007661] N75-23520
Method of the optimization of the load-carrying structure of wing on rigidity during variation by the distribution of thickness ratio
[AD-A007317] N75-23521
Experimental study of heat transfer during flow around uncambered delta wings with blunted edges
[AD-A007316] N75-23524
Calculation of loads and deformations of sweptback wing with the aid of mechanical analog instruments
[AD-A007308] N75-23525
Calculation of the reinforced thin-walled construction by the method of the final element
[AD-A007307] N75-23560
Some problems of modelling aeroelastic phenomena in a transonic tunnel
[AD-A007391] N75-23561
Optimum control of flight vehicle under the conditions of uncertainty
[AD-A007400] N75-23640
Ultrasonic pressure working of metals, chapters 2 and 5
[AD-A007695] N75-23783
Influence of a strong static electrical field on the absorption spectrum of mylar polyester
[AD-A007864] N75-23795
Electrotechnical handbook, volume 1, book 1, 4th edition revised selected parts 6 and 10
[AD-A003088] N75-23856
Flow of rarefied gas between two parallel plates
[AD-A007303] N75-23898
Spherical cavity in a free molecular flow
[AD-A007290] N75-23899
One class of the exact solutions of the equations of Navier-stokes for unsteady flow of the compressible gas in channels
[AD-A007402] N75-23903
Effect of nonequilibrium processes on the gas-dynamic parameters in hypersonic installations and in the critical point of a blunted body
[AD-A007414] N75-23904

Natural oscillations of liquid in a horizontal container with symmetric double-connected cross section
[AD-A007312] N75-23906
Flows with lambda-shaped shocks at the entrance into plane supersonic air inlet
[AD-A007458] N75-23907
Exact solutions of the equations of Navier-Stokes for the flow of the compressible gas in channels
[AD-A007683] N75-23908
Stress concentration in an expanded plate with opening reinforced by central belt
[AD-A007672] N75-24044
The criterion for optimum character for the selection of the thicknesses of plates which are located under the action of bending load
[AD-A007455] N75-24046
The approximation of correlation functions
[AD-A007664] N75-24423
Information devices and systems in prospecting geophysics
[AD-A007408] N75-24653

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Emergency ejection, sequence of operation
[AD-A007470] N75-23539
Repair dock for large aircraft
[AD-A007399] N75-23613
Approximate optimum control of the angle of roll in the problem of the reentry of hypersonic vehicles
[AD-A007456] N75-23641
Problems relating to wind tunnel simulation of relaxing flows
[AD-A007406] N75-23900
Experimental study of heat transfer in a critical point of sphere in hypersonic low-density flow
[AD-A007407] N75-23901
Explicit finite-difference diagram for the solution of the problem of flow by about the establishment
[AD-A007410] N75-23902
Numerical solution of the axisymmetric tasks of creep of circular cylindrical shells
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N75-23488

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N75-24020

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[AE-499] N75-23762

ALABAMA A & M UNIV., NORMAL.
Difference equation for superradiance
[NASA-CR-142875] N75-24439

ALABAMA UNIV., HUNTSVILLE.
Studies on immiscible alloys
[NASA-CR-120764] N75-23759

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Analysis of problems in rocket base heat transfer during the aspiration phase
N75-23675
Design of FIR digital filters for pulse shaping and channel equilization using time-domain optimization
N75-23817
A fast-initializing digital equalizer with on-line tracking for data communications
N75-23843
A systematic study of aplanatic two-mirror telescopes with application to the large spare telescope
N75-23914

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[ICP-1036] N75-23765

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[NASA-CR-120752] N75-23758

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[PB-238921/1] N75-23960

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[CONF-741202-13] N75-24450
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[CONF-740957-21] N75-24509
High field susceptibility in ferromagnetic NpOs2
[CONF-741057-3] N75-24510

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Terrestrial photovoltaic power systems with sunlight concentration
[PB-238506/0] N75-24136
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[AD-A007721] N75-24358
Efficient simulation of a computer system
N75-24381

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The effects of aberrations in synthetic aperture systems
[AD-A007774] N75-23954
Solar photothermal power conversion
N75-24100
Chemical vapor deposition research for fabrication of solar energy converters
[PB-238947/6] N75-24137
Symposium on the Material Science Aspects of Thin Film Systems for Solar Energy Conversion
[PB-239270/2] N75-24150
A stochastic snow model
N75-24227
Real-time wavefront correction through Bragg diffraction of light by sound waves
N75-24433
The effects of abberrations in synthetic aperture systems
N75-24463
Development of optical coatings for high-intensity laser applications
[AD-A007692] N75-24470
Infrared spectroscopy of Comet Kohoutek
[NASA-CR-142809] N75-24597

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[AD-A007812] N75-24357

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Differential sea ice drift
[AD-A007733] N75-24048
Simulated snowdrift patterns: Evaluation of geometric modeling criteria for a three dimensional structure
[AD-A007735] N75-24050
A digital computer simulation of the annual snow and soil thermal regimes at Barrow, Alaska
[AD-A007734] N75-24082
Red and near-infrared spectral reflectance of snow
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[AD-A007111] N75-23839

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Plane micromodules
[AD-A007854] N75-23865
Some electrical and photoelectrical properties of CdSnP2 single crystals
[AD-A007863] N75-24517
Thermoelectric properties of ceramic refractory semiconductors
[AD-A007862] N75-24519

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[AD-A007764] N75-23736
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N75-23504
Noise generation in transonic wind tunnels
[AD-A007688] N75-23614
Development of holographic interferometric applications in the VKF supersonic and hypersonic wind tunnels
[AD-A007689] N75-23615
Droplet diameter and size distribution of JP-4 fuel injected into a subsonic airstream
[AD-A007687] N75-24192

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N75-23491

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[AD-A007728] N75-23803

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[NASA-CR-141791] N75-24105

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Undercooling of materials during solidification in space
[NASA-CR-120750] N75-23624
Bistatic radar sea state monitoring field test
[NASA-CR-141394] N75-23919
Holographic recording materials development
[NASA-CR-132672] N75-23930
Fabrication and evaluation of an OSO-1 type baseplate
[NASA-CR-143794] N75-23985
Fabrication of experimental three-meter space telescope primary and secondary mirror support structure
[NASA-CR-143796] N75-23986
Calibration and evaluation of Skylab altimetry for geodetic determination of the geoid
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[BNWL-SA-5216] N75-24425
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[NASA-CR-120760] N75-23673
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N75-23507
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N75-23505

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N75-23578

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Steady incompressible potential flow around lifting bodies immersed in a fluid
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N75-24012
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N75-23496

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N75-23997

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[BNL-19365] N75-24409
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[BNL-19300] N75-24442
Effect of metallurgical history on Jc[5T] in surface diffused multifilamentary Nb3Sn
[BNL-19271] N75-24511
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Report on the Brookhaven solar neutrino experiment
[BNL-19278] N75-24652

BROWN UNIV., PROVIDENCE, R.I.
Flame spreading on horizontal and vertical fuel surfaces
N75-23723
Nuclear magnetic resonance studies of glasses and related crystalline materials
N75-23784
Problems in nonlinear mechanics of unstable waves in turbulent and in stratified shear flows. Part 1: Development of the noise-producing large-scale structure in a turbulent jet. Part 2: Nonlinear KelvinHelmholtz waves and the vertical mixing mechanism in a stratified shear flow. Part 3: Nonlinear interactions of the large-scale coherent structure and turbulence in a free shear flow
N75-23874
An oscillating-cup viscometer for high pressure, high temperature mercury
N75-23916
Time development of ultrashort pulse generation from a Nd:glass laser with a saturable dye and short laser pulse damage of GaAs and ZnTe at 1.06 microns
N75-23964
Kapitza resistance and the reflection coefficient of heat pulses
N75-24462
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N75-24473
Martian obliterational history
N75-24610

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Strong motion earthquake accelerograms digitized and plotted data. Volume 2: Corrected accelerograms and integrated ground velocity and displacement curves. Part Q and R: Accelerograms IIQ233 to IIQ243 and IIR244 to IIR254
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N75-24604
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The effect of grain size and retained austenite on the ductile-brittle transition of a titanium-gettered iron alloy
[AD-A007360] N75-23780
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Aerodynamic design of cooling tower drift eliminators
[PB-238952/6] N75-24149
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[NASA-CR-142825] N75-24296

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[LBL-3174] N75-23766
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[LBL-3151] N75-23767
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[LBL-2775] N75-23768
Probabilistic approach to plasticity in polycrystalline materials using dislocation mechanics
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[LBL-3363] N75-24451

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N75-24494

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[UCRL-75320] N75-23728
Smoke hazards from burning plastics
[UCRL-76015] N75-23809
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[UCRL-75814] N75-23969
Microprocessors in computing
[UCRL-76234] N75-24385
DT fusion neutron irradiation of ORNL magnesium oxide crystal, BPNL molybdenum, LLL copper tensile specimens, LLL machinable glass ceramic, and UW/LLL high purity metallic foils
[UCID-16665] N75-24443
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Guiding center simulation of toroidal plasmas
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[AD-A007285] N75-24084
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[AD-A007552] N75-24397
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[PB-239431/0] N75-24404
Solution of simultaneous partial differential equations: An extension of PDEL
[PB-239432/8] N75-24405
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[AD-A007417] N75-24410
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[AD-A007259] N75-24487
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N75-24574
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N75-24590
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N75-23998
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A testability measure for register-transfer level digital circuits
N75-23844
CATHOLIC UNIV. OF AMERICA, WASHINGTON, D.C.
Infra-Red lasers and infra-red spectra of free radicals
[AD-A007720] N75-23978
CBS LABS., STAMFORD, CONN.
Design study for a sensor utilizing an electrostatic camera. Volume 2: Appendices
[AD-A007070] N75-23940
CENTRE D'ESSAIS DE PROPULSEURS, SACLAY [FRANCE].
Contribution of flight simulation tests to the study of turbomachine control
N75-23577
CENTRE D'ETUDE DES MATIERES PLASTIQUES, PARIS [FRANCE].
Influence of fabrication parameters on the rupture of glass fiber reinforced plastics
N75-23704
CENTRE D'ETUDES ET RECHERCHES DES CHARBONNAGES DE FRANCE, CREIL.
Study of fiber reinforcement of thermoplastic polymers
N75-23695
CENTRE DE RECHERCHES SCIENTIFIQUES ET TECHNIQUES DE L'INDUSTRIE DES FABRICATIONS METALLIQUES, BRUSSELS [BELGIUM].
A finite element analysis of bodies of revolution. A comparison between currently used types of elements
[CRIF-MT-102] N75-24422
CENTRE DE RECHERCHES SUR LES PROBLEMES DE POLLUTION, LAGOR [FRANCE].
Refractometric measurements in the Lacq area
N75-24206
CENTRE INTERPROFESSIONNEL TECHNIQUE D'ETUDES DE LA POLLUTION ATMOSPHERIQUE, PARIS [FRANCE].
Construction of a monolingual thesaurus on atmospheric pollution
N75-24531
CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE [FRANCE].
Composite self lubricating materials for space applications
N75-24005
Method for continuous torque measurement of dry miniature bearings
N75-24006
Presentation of tests on gears performed at CNES
N75-24015
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, MEUDON [FRANCE].
Friction of the couples copper-copper, molybdenum-molybdenum, copper-molybdenum and copper-nickel in the ultrahigh vacuum
N75-24002
Optical observations of a few small H2 regions detected at infrared wavelengths
N75-24557
CENTRO DI STUDI E RICERCHE DI MEDICINA AERONAUTICA E SPAZIALE, ROME [ITALY].
Catecholamine excretion from air cadets
N75-24303
Flight fitness and psycho-physiological behavior of applicant pilots in the first flight missions
N75-24304
CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO.
APS-73 cross assembler reference manual
[PB-238821/3] N75-24403
CHEMICAL LAB. RVO-TNO, RIJSWIKJ [NETHERLANDS].
The dynamics of adsorption of vapours by porous adsorbents in fixed beds. [Breakthrough curves of sarin on charcoal in the very low concentration region]
[TDCK-65300] N75-24167
Non-destructive test of charcoal filters. Part 3: Characteristics of the elution peaks of ethane and propane on partially spent charcoal filters of various moisture contents
[TDCK-65348] N75-24168
Reactivating potency of some oximes towards phosphylated acetylcholinesterase
[TDCK-65518] N75-24310
CHRYSLER CORP., NEW ORLEANS, LA.
An experimental investigation of the aerodynamic characteristics of several nose mounted canard configurations at supersonic Mach numbers
[AD-A007793] N75-23526
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [iA14B], volume 1
[NASA-CR-141522] N75-23647
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 9 by 7 foot unitary plan wind tunnel for Mach 1.55 and 2.2 [IA14B], volume 2
[NASA-CR-141523] N75-23648
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the 11-foot unitary plan wind tunnel for Mach 0.6 and 0.9 [0A22A]
[NASA-CR-141529] N75-23649
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B orbiter configuration [model 47-0] in the arc 9 by 7-foot unitary plan wind tunnel for Mach 1.55 and 2.2 [OA22B]
[NASA-CR-141530] N75-23650
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 3
[NASA-CR-134445] N75-23657
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-Foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 4
[NASA-CR-134446] N75-23658
Airloads investigation of an 0.30-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 5
[NASA-CR-134447] N75-23659
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 6
[NASA-CR-134448] N75-23660
Airloads investigation of an 0.030 scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 7
[NASA-CR-134449] N75-23661
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the arc 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 8
[NASA-CR-134450] N75-23662
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 9
[NASA-CR-141501] N75-23663
Airloads investigation of an 0.030-scale model of the Space Shuttle Vehicle 140 A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for MACH range 0.6 to 1.4 [IA14A], volume 10
[NASA-CR-141502] N75-23664
Airloads investigation of an 0.030-scale model of the space shuttle vehicle 140A/B launch configuration [model 47-OTS] in the ARC 11-foot Unitary Plan Wind Tunnel for Mach range 0.6 to 1.4 [IA14A], volume 11
[NASA-CR-141503] N75-23665
Results of transonic wind tunnel tests on an 0.010-scale space shuttle mated vehicle model 72-OTS in the LaRC 8-foot TPT [IA43]
[NASA-CR-141525] N75-23666
CINCINNATI UNIV., OHIO.
Supersonic laminar boundary layer flow past a wavy wall with multiple separation regions
[AD-A007433] N75-23905
CIVIL AEROMEDICAL INST., OKLAHOMA CITY, OKLA.
Predictive validities of several clinical color vision tests for aviation signal light gun performance
[AD-A606792] N75-24317
CLEMSON UNIV., S.C.
Determining land use changes in watersheds by aerial photographic measurements
[PB-239192/8] N75-24080
Correlation of hydrologic model parameters with changing land use as determined from aerial photographs
[PB-239407/0] N75-24093
Electron tunneling in semimetallic films
N75-24490
COAST GUARD RESEARCH AND DEVELOPMENT CENTER, GROTON, CONN.
Evaluation of the Expendable Surface Current Probe [ESCP]
[AD-A007877] N75-23943
COLORADO UNIV., BOULDER.
Using blossoms to find maximum matchings on graphs
[PB-238971/6] N75-24377
Optimal scheduling of homogeneous job systems
[PB-238972/4] N75-24402
COLT INDUSTRIES, INC., WEST HARTFORD, CONN.
Advanced engine mounted fuel pump technology
N75-23601
COMMISSARIAT A L'ENERGIE ATOMIQUE, TOULOUSE [FRANCE].
Possible utilization of electron scan microscope for the study of composite materials with organic matrix
N75-23708
COMMITTEE OF CONFERENCE [U. S. CONGRESS].
Energy Reorganization Act of 1974
[S-REPT-93-1252] N75-24123
COMMITTEE ON APPROPRIATIONS [U. S. HOUSE].
Department of Housing and Urban Development-independent agencies appropriations for 1976. Part 2: National Aeronautics and Space Administration
[GPO-51-423] N75-24542
COMMITTEE ON BANKING AND CURRENCY [U. S. HOUSE].
The economics of energy and natural resource pricing
[GPO-48-071] N75-24115
COMMITTEE ON FOREIGN RELATIONS [U. S. SENATE].
Energy and foreign policy
[GPO-22-562] N75-24125
COMMITTEE ON GOVERNMENT OPERATIONS [U. S. SENATE].
Energy Reorganization Act of 1974
[S-REPT-93-980] N75-24124
COMMUNICATIONS RESEARCH CENTRE, OTTAWA [ONTARIO].
Communications experimenter's guide. Communications technology satellite
[CRC-TN-671[CS-03-01]] N75-23655
Proceedings of the Canadian Workshop on acoustic surface waves
[CRC-R-1260] N75-23821
A structural dynamics model for flexible solar arrays of the communications technology satellite
[CRC-1268] N75-24034
COMPAGNIE DE SAINT GOBAIN [FRANCE].
Study on the behavior of layered glass-resin under dynamic load [fatigue]
N75-24030
COMPAGNIE ELECTRO-MECANIQUE, LE BLANC-MESNIL [FRANCE].
Shape and dimensional control of tridimentional objects
N75-24464
CONNECTICUT UNIV., STORRS.
Use of interactive computer graphics in water resources planning and management
[PB-238631/6] N75-24079
Electric power generation utilizing a heat pipe turbine-generator
N75-24096

CONSERVATOIRE NATIONAL DES ARTS ET METIERS, PARIS [FRANCE].
Study of a group of documentation systems in order to determine the interconnection and the exchange possibilities at the level of sectorial networks and to recommend the means necessary for this harmonization
N75-24530

CONSIGLIO NAZIONALE DELLE RICERCHE, FRASCATI [ITALY].
NGC 7635 and its stellar nucleus
N75-24558
Dust in H2 regions
N75-24577

CONTROL DATA CORP., ARDEN HILLS, MINN.
Study of the modifications needed for efficient operation of NASTRAN on the Control Data Corporation STAR-100 computer
[NASA-CR-132644] N75-24382

CORNELL UNIV., ITHACA, N.Y.
Research on helicopter rotor noise
[AD-A007261] N75-23608
Four particle exchange in solid He-3
[NASA-CR-142801] N75-24503
Expected far infrared polarization of H2 regions and the nuclei of galaxies
N75-24579

CORPS OF ENGINEERS, WALTHAM, MASS.
The use of ERTS imagery in reservoir management and operation
[E75-10286] N75-24059

CRANFIELD INST. OF TECHNOLOGY [ENGLAND].
The influence of short springs on longitudinal static stability
[CRANFIELD-AERO-29] N75-23607

CURRAN ASSOCIATES, INC., NORTHAMPTON, MASS.
Evaluation of power facilities; A reviewer's handbook
[PB-239221/5] N75-24198

D

DANISH ATOMIC ENERGY COMMISSION, RISOE.
Metallurgy Department
[RISO-304] N75-23771
Excitations and magnetic properties of rare-earth Al2 compounds
[RISO-312] N75-23772

DEFENCE AND CIVIL INST. OF ENVIRONMENTAL MEDICINE, DOWNSVIEW [ONTARIO].
CF5D aircraft cockpit-noise reduction
[DCIEM-74-R-1048] N75-23564
Aerodrome air traffic control in the Canadian Forces
[DCIEM-74-R-1067] N75-24363

DEFENCE RESEARCH ESTABLISHMENT VALCARTIER [QUEBEC].
Deformation of the atmosphere by intense laser beams at 10.6 microns
[DREV-TN-2099/74] N75-23965

DELCO ELECTRONICS, SANTA BARBARA, CALIF.
Source encoding for orbiter communications links
[NASA-CR-141792] N75-23653

DENVER UNIV., COLO.
A study of geomagnetic storms
[NASA-CR-142800] N75-24208

DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD, WASHINGTON, D.C.
Minutes of the 16th Explosives Safety Seminar, volume 1
[AD-A007557] N75-23801
Minutes of the 16th Explosives Safety Seminar, volume 2
[AD-A007566] N75-23802

DEPARTMENT OF TRANSPORTATION, WASHINGTON, D.C.
The airport/urban interface
[PB-238914/6] N75-23618

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK [WEST GERMANY].
Prediction of the optimum location of a nacelle shaped body on the wing of a wing-body configuration by inviscid flow analysis
N75-23510

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, MUNICH [WEST GERMANY].
A dry lubrication system for spaceproofed bearings
N75-24008

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, PORZ [WEST GERMANY].
Detailed experimental and theoretical analysis of the aerodynamic interference between lifting jets and the fuselage and wing
N75-23509

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, STUTTGART [WEST GERMANY].
An experimental study to determine failure envelope of composite materials with tubular specimens under combined loads and comparison between several classical criteria
N75-23701

DIRECTION DES RECHERCHES ET MOYENS D'ESSAIS, PARIS [FRANCE].
Standardization of objective medico-psychiatric questionnaire in the French Army
N75-24307

DISTRICT OF COLUMBIA TEACHERS COLLEGE, WASHINGTON, D.C.
Investigation of problems associated with solid encapsulation of high voltage electronic assemblies; also Reynolds connector study
[NASA-CR-142803] N75-23849

DORNIER-WERKE G.M.B.H., FRIEDRICHSHAFEN [WEST GERMANY].
Practical finite element method of failure prediction for composite material structures
N75-23703

DOUGLAS AIRCRAFT CO., INC., SANTA MONICA, CALIF.
Analysis of operational requirements for medium density air transportation. Volume 1: Summary
[NASA-CR-137603] N75-23534

DOWTY FUEL SYSTEMS, LTD., CHELTENHAM [ENGLAND].
Afterburning regulation concepts
N75-23587
Pumping system design related to fuel system specifications
N75-23600

DREXEL UNIV., PHILADELPHIA, PA.
Utilization analysis of energy systems
[PB-239291/8] N75-24144

DUDLEY OBSERVATORY, ALBANY, N.Y.
Evolutionary characteristics of a bimodal grain model
N75-24576
Dust in the galactic center
N75-24584

DUKE UNIV., DURHAM, N.C.
Plasticity theory of fiber-reinforced metal matrix composites
N75-23694
A study of the physical properties and bistable conduction characteristics of amorphous bismuth thioxide thin films
N75-24493
Nuclear magnetic resonance studies of solid hydrogen under high pressure
N75-24498

E

EARTH SATELLITE CORP., WASHINGTON, D.C.
Remote sensing applications to resource management problems in the sahel
[PB-239867/5] N75-24087

ECOLE CENTRALE DES ARTS ET MANUFACTURES, CHATENAY-MALABRY [FRANCE].
Determination of the shape, size, and orientation of defects by ultrasonic tests
N75-23749

ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE [SWITZERLAND].
Generation of monochromatic electrostatic waves of large amplitudes in a bounded beam-plasma system
[LRP-88/74] N75-24481

ECOLE POLYTECHNIQUE, MONTREAL [QUEBEC].
Thermal strain determination using gages imbedded in plastic material mock-ups under time-dependent temperature variations
N75-23918

ECOLE POLYTECHNIQUE, PARIS [FRANCE].
Fracture mechanics of metallic structures
N75-24028

ELECTRIC POWER RESEARCH INST., PALO ALTO, CALIF.
Conference proceedings, Steam Power Plant Workshop
[PB-239514/3] N75-24148

ENVIRONMENTAL PROTECTION AGENCY, ARLINGTON, VA.
Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety
[PB-239429/4] N75-24351

ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
A 1964 digital data base for ionospheric modeling. Part B: Incoherent scatter radar results
[COM-75-10199/8] N75-23827
Guidelines for air quality maintenance planning and analysis. Volume 2. Plan preparation
[PB-237581/4] N75-24169
Guidelines for air quality maintenance planning and analysis. Volume 3: Control strategies
[PB-237582/2] N75-24170
Guidelines for air quality maintenance planning and analysis. Volume 4: Land use and transportation considerations
[PB-237583/0] N75-24171
Guidelines for air quality maintenance planning and analysis. Volume 6. Overview of air quality maintenance area analysis
[PB-237584/8] N75-24172
Guidelines for air quality maintenance planning and analysis. Volume 8: Computer-assisted area source emission gridding procedure
[PB-237585/5] N75-24174
Guidelines for air quality maintenence planning and analysis: Volume 11: Air quality monitoring and data analysis
[PB-237626/7] N75-24176
Guidelines for air quality maintenance planning and analysis. Volume 12: Applying atmospheric simulation models to air quality maintenance areas
[PB-237750/5] N75-24177

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Proceedings of seminar on methodology for monitoring the marine environment
[PB-239052/4] N75-24178
Preliminary assessment of the environmental problems associated with vinyl chloride and polyvinyl chloride
[PB-239110/0] N75-24196

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., LEXINGTON, MASS.
Experimental evaluation of atmospheric effects on radiometric measurements using the EREP of Skylab
[E75-10283] N75-24056

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR.
Developing processing techniques for Skylab data
[E75-10289] N75-24062
Investigation of multispectral techniques for remotely identifying terrain features and natural materials
[PB-238675/3] N75-24078

ESSEX CORP., ALEXANDRIA, VA.
Development and validation of methods for man-made machine interface evaluation
[NASA-CR-142824] N75-24359

EUROPEAN SOUTHERN OBSERVATORY, LA SILLA [CHILE].
On the structure of M17S
N75-24563
The dominant 10 to 20 micrometer source in the galactic centre
N75-24585

EUROPEAN SPACE OPERATIONS CENTER, DARMSTADT [WEST GERMANY].
Perturbation of a planetary orbiter by radiation pressure, account being taken of variation in the distance and direction of the sun
[ESRO-SR-24-ESOC] N75-23639

EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTER, NOORDWIJK [NETHERLANDS].
Dynamic analysis of a satellite with deformable parts
[ESRO-SR-22-ESTEC] N75-23670

EUROPEAN SPACE RESEARCH ORGANIZATION, PARIS [FRANCE].
Contributions to the calculation of satellite transfer from near-earth to geostationary orbits by small thrust-acceleration in regularised variables
[ESRO-TT-138] N75-23638
H2 regions and the galactic centre
[ESRO-SP-105] N75-24555

EXXON RESEARCH AND ENGINEERING CO., LINDEN, N.J.
Development of high stability fuel
[AD-A007574] N75-23604

F

FACILITY CHECKING SQUADRON [1866TH] [AFCS], RICHARDS-GEBAUR AFB, MO.
Radar station evaluation report, Pease AFB, New Hampshire
[AD-A007041] N75-23553

FAUCETT [JACK] ASSOCIATES, INC., CHEVY CHASE, MD.
The economic and environmental benefits from improving electrical rate structures
[PB-239451/8] N75-24541

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D.C.
Engineering and development program plan; en route control
[AD-A007623] N75-23550

FEDERAL COUNCIL FOR SCIENCE AND TECHNOLOGY, WASHINGTON, D.C.
Report on the Federal research and development program, fiscal year 1976
[PB-239528/3] N75-24527

FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, D.C.
Highway travel forecasts
[PB-239169/6] N75-24549
FERSON OPTICS, OCEAN SPRINGS, MISS.
Acoustic lens design
[AD-A007847] N75-24435
FISK UNIV., NASHVILLE, TENN.
Properties of scattering amplitudes at very high energies
[NASA-CR-142762] N75-24445
FLEET NUMERICAL WEATHER FACILITY, MONTEREY, CALIF.
Automated long range [ANALOG] forecast model
[AD-A007846] N75-24252

G

GCA CORP., BEDFORD, MASS.
Guidelines for air quality maintenence planning and analysis: Volume 11: Air quality monitoring and data analysis
[PB-237626/7] N75-24176
GENERAL APPLIED SCIENCE LABS., INC., WESTBURY, N.Y.
Psychophysical tests of potential design/certification criteria for advanced supersonic aircraft
[AD-A009296] N75-24354
GENERAL DYNAMICS CORP., GROTON, CONN.
An experimental study of the surface effect on a bouyant jet
[PB-239536/6] N75-23897
GENERAL DYNAMICS CORP., SAN DIEGO, CALIF.
Controllable liquid artificial dielectric S-band phase shifters
[AD-A007785] N75-23868
GENERAL DYNAMICS/CONVAIR, SAN DIEGO, CALIF.
Space LOX vent system
[NASA-CR-120769] N75-23685
GENERAL DYNAMICS/ELECTRONICS, SAN DIEGO, CALIF.
Microwave holography for analysis of conformal arrays
[AD-A007359] N75-23953
GENERAL DYNAMICS/FORT WORTH, TEX.
Aircraft engine nacelle fire test simulator
[AD-A007853] N75-23617
GENERAL ELECTRIC CO., BELTSVILLE, MD.
LANDSAT-2 launch and flight activation. Lauach through orbit 50 and orbit adjust operation
[NASA-CR-143744] N75-23630
GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Examination of the influence of coatings on thin superalloy sections. Volume 1: Description and analysis
[NASA-CR-134791] N75-23755
Examination of the influence of coatings on thin superalloy sections. Volume 2: Detailed procedures and data
[NASA-CR-134792] N75-23756
GENERAL ELECTRIC CO., SANTA BARBARA, CALIF.
Reaction rate data. Number 48: Annual summary of progress in FY 1974 DNA reaction rate program
[AD-A006574] N75-24216
GEOLOGICAL SURVEY, RESTON, VA.
Second EROS/AID international course on remote sensing
[PB-239479/9] N75-24088
GEOMET, INC., ROCKVILLE, MD.
Guidelines for air quality maintenance planning and analysis. Volume 10: Reviewing new stationary sources
[PB-237535/0] N75-24175
GEORGETOWN UNIV., WASHINGTON, D.C.
Study of very pure metals at low temperature
[ORO-3665-44] N75-23764
GEORGIA INST. OF TECH., ATLANTA.
Complex metal hydrides: High energy fuel components for solid propellant rocket motors
[AD-A007353] N75-23779
Study of USGS/NASA land use classification system
[NASA-CR-120763] N75-24069
Microwave transient response measurements of elastic momentum transfer collision frequency
[ORO-3027-26] N75-24444
GORDIAN ASSOCIATES, INC., NEW YORK.
Where the boilers are: A survey of electric utility boilers with potential capacity for burning solid waste as fuel
[PB-239392/4] N75-24135
GRENOBLE UNIV. [FRANCE].
Manual for the use of particle trajectories programs to first order of the optic series
[ISN-74-12] N75-24447
GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
An experimental investigation of the component drag composition of a two-dimensional inlet at transonic and supersonic speeds
N75-23489
GULF RESEARCH AND DEVELOPMENT CO., PITTSBURGH, PA.
Polynuclear aromatic content of heavy duty diesel engine exhaust gases
[PB-238688/6] N75-24195

H

HALE OBSERVATORIES, PASADENA, CALIF.
Infrared observation of NGC 6334
N75-24561
HAMILTON STANDARD DIV., UNITED AIRCRAFT CORP., WINDSOR LOCKS, CONN.
Engine control for harpoon missile system
N75-23580
HAMILTON STANDARD, WINDSOR LOCKS, CONN.
Phase 1 engineering and technical data report for the thermal control extravehicular life support system
[NASA-CR-141793] N75-24360
HANFORD ENGINEERING DEVELOPMENT LAB., RICHLAND, WASH.
Irradiation effects on reactor structural materials
[HEDL-TME-74-51] N75-24038
Computer controlled data acquisition system for the high temperature sodium test facility
[HEDL-TME-74-60] N75-24533
HARVARD COLL. OBSERVATORY, CAMBRIDGE, MASS.
Compact infrared sources associated with southern H2 regions
N75-24560
High-resolution maps of H2 regions at far-infrared wavelengths
N75-24567
HAWAII UNIV., HONOLULU.
Some characteristics of Hawaiian high intensity rainfall
[PB-239398/1] N75-24261
HAWKER SIDDELEY DYNAMICS LTD., HATFIELD [ENGLAND].
The use of carbon fibre reinforced plastics in satellite structures. Volume 1: Summary
[HSD-TP-7509-VOL-1-SUMM] N75-23713
HEIMANN G.M.B.H., WIESBADEN [WEST GERMANY].
Image-storage tube for space applications. Development of the SEC target
[ESRO-CR-212] N75-23938
HONEYWELL, INC., MINNEAPOLIS, MINN.
Real time display parameters study 2
[AD-A007790] N75-24367
HONEYWELL, INC., ST. LOUIS PARK, MINN.
Cryogenic mass flowmeter development
[AD-A007794] N75-23942
HOUSTON UNIV., TEX.
Analysis of fluid flow in the entrance region of a duct with an eccentric annular cross-section
N75-23472
HUGHES AIRCRAFT CO., CULVER CITY, CALIF.
Advanced technical evaluation of a master monitor display
[AD-A007699] N75-23566
Experiment definition phase shuttle laboratory LDRL-10.6 experiment
[NASA-CR-143746] N75-23652
HUGHES RESEARCH LABS., MALIBU, CALIF.
Solid state amplifier for spread spectrum communications
[AD-A007789] N75-23858
Pyroelectric film/liquid crystal detector for 10.6 micrometers region
[AD-A007852] N75-23949
Laser window surface finishing and coating technology
[AD-A007791] N75-24466
HYDROMECANIQUE ET FROTTEMENT, ANDREZIEUX [FRANCE].
Possible applications of surface treatment to ultrahigh vacuum friction for space utilization
N75-23626

I

IIT RESEARCH INST., CHICAGO, ILL.
Attitude control propulsion components, volume 1
[NASA-CR-136741-VOL-1] N75-23676
Attitude control propulsion components, volume 2
[NASA-CR-136741-VOL-2] N75-23677
Optical methods for testing composite materials
N75-23707
ILLINOIS UNIV., CHICAGO.
As asymptotic ignition theory of porous solid fuels [thermo-diffusive theory]
N75-23798
On the statistical theory of the propagation and scattering of light in simple fluids
N75-24460
ILLINOIS UNIV., URBANA.
Flow of a particulate suspension in the wake of a circular cylinder
N75-23471
On the electric propulsion/mission system: Energy, constraints, and characteristic surfaces
N75-23674
The oxidation of ethylene in automotive engine exhaust gas; an experimental investigation
N75-23719
The application of quadrupole mass spectrometry to nitrogen isotope analysis
N75-23720
An automated approach to some basic sample handling concepts
N75-23721
Investigation of hydrogen chemisorption on the tungsten [100] surface
[AD-A007434] N75-23731
Complex waveform phonetic speech synthesis
N75-23814
Numerical solutions to the problems of electromagnetic radiation and scattering by a finite hollow cylinder
N75-23816
Correlation modulation
[AD-A007338] N75-23837
The design of multiple-valued asynchronous sequential circuits
N75-23846
Lower bounds on merging networks
[PB-238554/0] N75-23855
Radiative transfer between surfaces with spectral, directional, and temperature dependent properties
N75-23873
Polarization potentials and elementary excitations in strongly interacting quantum liquids
N75-23875
An automated molecular fluorescence/absorption sequential analyzer with laser source
N75-23911
The generation of step-tunable far infrared radiation by phase matched difference frequency mixing in planar dielectric waveguides
N75-23963
A probabilistic analysis of structural reliability against fatigue and fracture
N75-24021
An evaluation of the partial-reflection technique and results from the winter 1971-1972 D region
N75-24051
An experimental investigation of the turbulent characteristics of co-axial jet flows and their role in aerodynamic noise generation
N75-24161
An investigation of odd nitrogen in the ionospheric E region
N75-24204
Use of macros in backtrack programming
[PB-238644/9] N75-24386
NOR network transduction procedures: Merging of gates and substitution of gates for fan-in and fan-out restricted networks [NETTRA-G3-FIFO and NETTRA-PG1-FIFO]
[PB-238944/3] N75-24401
Deadlock in distributed computer networks
[PB-238943/5] N75-24412
Control of mixed distributed and lumped parameter systems
N75-24418
Application of complex ray tracing to the scattering of an evanescent plane wave by a conducting circular cylinder
N75-24429
Ion implantation sources and source materials
[AD-A007431] N75-24516
On minimax decision theory: A Banach space approach
N75-24525
The use of supernovae light curves for testing the expansion hypothesis and other cosmological relations
N75-24592
IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON [ENGLAND].
The background to current theories of scuffing
[S/T-MEMO-5/73] N75-23991
Elastohydrodynamic lubrication in line contact
N75-23992
Lubrication breakdown under boundary conditions
N75-23993
The action of oil additives
N75-23994
Metallurgical aspects of scuffing
N75-23995
INDIAN NATIONAL SCIENTIFIC DOCUMENTATION CENTRE, NEW DELHI.
Chemistry of organic sulfur compounds contained in petroleums and petroleum products, Volume 7
[TT-70-57759] N75-23691
Temperature field and heat flow in snow cover
[TT-71-51011] N75-24086
INFORMATICS, INC., ROCKVILLE, MD.
Civil aviation studies and interagency coordinating organizations, volume 1
[PB-239344/5] N75-24186
Civil aviation studies and interagency coordinating organizations, volume 2: Appendices
[PB-239345/2] N75-24187

INSTITUT D'AERONOMIE SPATIALE DE BELGIQUE, BRUSSELS.
The effects of field aligned ionization models on the electron densities and total flux tubes contents deduced by the method of whistler analysis [AERONOMICA-ACTA-A-139-1974] N75-24205

INSTITUT D'HYGIENE ET D'EPIDEMIOLOGIE, BRUSSELS [BELGIUM].
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages N75-24165

Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages N75-24166

INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS [FRANCE].
Selected contributions to high-speed physics [BMVG-FBWT-74-8] N75-23804

Nonlinear conversion of ferroelectric energy and energy conversion by forced transition with Pb[Zr sub (1-x)Ti sub x]O3 ceramics N75-23805

Application of mode locked solid state lasers to photographic investigation of transient phenomena N75-23806

Output energy optimization of a dye laser N75-23807

Study and application of pulsed CO2 lasers N75-23808

Efficiency of steel fragments on thin duralumin targets [ISL-12/74] N75-24009

INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE, PARIS [FRANCE].
Multispectral aerial reconnaissance of parasitic attacks in forests: Remote sensing N75-24052

INSTITUT NATIONAL DES SCIENCES APPLIQUEES, VILLEURBANNE [FRANCE].
Third body formation and elimination on carbon fiber epoxy composite N75-24004

INSTITUT NATIONAL POLYTECHNIQUE, NANCY [FRANCE].
Performance improvement of aluminum and titanium based alloys by new tempering methods for cooling acceleration and reduction of residual stresses N75-24029

INSTITUT ROYAL METEOROLOGIQUE DE BELGIQUE, BRUSSELS.
Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages N75-24165

Atmospheric pollution. Part 1: Smoke and sulfur dioxide. Part 2: Precipitation measurements using storage gages N75-24166

INSTITUT SUPERIEUR DES MATERIAUX ET DE LA CONSTRUCTION MECANIQUE, SAINT-OUEN [FRANCE].
Inelastic behaviour of composites [plastic prediction by limit analysis] N75-23702

INSTITUTE OF AVIATION MEDICINE, FUERSTENFELDBRUCK [WEST GERMANY].
Psychic health: A quantite negligeable in flying fitness examinations N75-24308

INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Hydrogen production from coal [NASA-CR-142816] N75-24113

INSTITUTUL DE FIZICA ATOMICA, BUCHAREST [ROMANIA].
Computing programme for a two sublattice neel ferrimagnet, application to the rareearth compounds [IFA-SR-9-1974] N75-23770

INTERMETRICS, INC., CAMBRIDGE, MASS.
Post-test navigation data analysis techniques for the shuttle ALT [NASA-CR-141789] N75-23629

INTERNATIONAL BUSINESS MACHINES CORP., HUNTSVILLE, ALA.
Astrionic system optimization and modular astrionics for NASA missions after 1974. Preliminary definition of astrionic system for space tug Mission Vehicle Payload [MVP] [NASA-CR-120618] N75-23627

INTERNATIONAL HARVESTER CO., SAN DIEGO, CALIF.
Temperature measurement for advanced gas turbine controls N75-23597

INTERTECHNOLOGY CORP., WARRENTON, VA.
The energy plantation N75-24103

INTERUNIVERSITAIR REACTOR INSTITUUT, DELFT [NETHERLANDS].
Ionization in the track of a high-energy electron in hydrocarbon liquids. Study of positive and negative ion scavenging using nanosecond pulse radiolysis [IRI-133-74-06] N75-24455

IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES.
Coal processing by electrofluidics [PB-238973/2] N75-23741

Structure and properties of steels theromomechanically processed by impact extrusion [AEC-IS-T-652] N75-23746

An analysis of droplet size distribution during monopropellant spray combustion N75-23799

Laminar flow heat transfer in ordinary and augmented tubes N75-23879

Hardware-software interactions in SYMBOL-2R's operating system [PB-239220/7] N75-24378

Controllability of a steady-state Tokamak fusion reactor [CONF-741086-9] N75-24453

IOWA UNIV., IOWA CITY.
Electron precipitation in the post midnight sector of the auroral zones [NASA-CR-142812] N75-24209

Application of internal analysis to problems of linear control systems N75-24413

Plasma in the Jovian magnetosphere [NASA-CR-142761] N75-24605

ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, LTD., JERUSALEM.
Radioisotopes and global transport in the atmosphere [TT-74-50025] N75-24190

Noise abatement [TT-73-50040] N75-24193

Seismic properties of the Mohorovicic discontinuity [TT-74-50029] N75-24219

Seismic waves [TT-74-50021] N75-24220

Cloud physics: Experimental investigations [TT-73-50032] N75-24250

J

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA.
Attitude control propulsion components, volume 1 [NASA-CR-136741-VOL-1] N75-23676

Attitude control propulsion components, volume 2 [NASA-CR-136741-VOL-2] N75-23677

Wide angle sun sensor [NASA-CASE-NPO-13327-1] N75-23910

Planetary quarantine: Supporting research and technology [NASA-CR-142878] N75-24362

Innermost planets of the solar system [NASA-CR-142827] N75-24627

Venus and Mercury as planets [NASA-CR-142826] N75-24628

Mission to the inner planets [NASA-CR-142828] N75-24629

Venus and Mercury encounters [NASA-CR-142829] N75-24630

JOHNS HOPKINS UNIV., BALTIMORE, MD.
High resolution spectra of rare earth crystals [AD-A007262] N75-23732

JOINT COMMITTE ON ATOMIC ENERGY [U. S. CONGRESS].
Solar energy research and development [GPO-40-684] N75-24104

JOINT ECONOMIC COMMITTEE [U. S. CONGRESS].
Energy imports and the US balance of payments [GPO-28-965] N75-24114

JOINT INST. FOR NUCLEAR RESEARCH, DUBNA [USSR].
Low temperature magnetization for Heisenberg ferromagnet [JINR-P4-8032] N75-24432

JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
In outer space [NASA-TT-F-16252] N75-23625

ITS-K infrared cryogenic telescope-spectro-meter aboard Salyut-4 [NASA-TT-F-16355] N75-23936

New look of the old moon [NASA-TT-F-16253] N75-24640

Translations on eastern Europe: Scientific affairs, no. 464 [JPRS-64751] N75-24655

New technologies in metallurgy studied by Research Institute N75-24656

Digital film and precipitation meter, and oil pollution metering device N75-24657

Achievements and tasks of solid-state research in Hungary N75-24658

Setup of administrative computer service described N75-24659

Romanian computers and office equipment described N75-24660

Research lab at Turda Electroceramica Plant described N75-24661

Soviet bloc research in geophysics, astronomy, and space, no. 348 [JPRS-64770] N75-24662

K

KANNER [LEO] ASSOCIATES, REDWOOD CITY, CALIF.
Ground effects for jet lift VTOL [NASA-TT-F-16359] N75-23480

The Apollo-Soyuz test flight [NASA-TT-F-16386] N75-23621

The Soyuz and Apollo spacecraft [NASA-TT-F-16371] N75-23622

Operation of descent module of the Mars-6 automatic interplanetary station in the Martian atmosphere [NASA-TT-F-16334] N75-23631

Collection of problems on the dynamics of a point in a central force field [NASA-TT-F-16263] N75-23633

FORTRAN program for calculating the trajectory of projectiles [NASA-TT-F-16316] N75-23634

Graphics of space mechanics analytical-graphical methods in space navigation [NASA-TT-F-16298] N75-23636

Essentials of the theory of flight and elements of designing artificial earth satellites [NASA-TT-F-16220] N75-23637

The Soyuz: Ready for flight [NASA-TT-F-16369] N75-23646

Pressures and elevations from CO2 band intensities based on measurements made on board the Mars-5 automatic interplanetary station [preliminary results] [NASA-TT-F-16346] N75-23671

Variations in the work function of [100]W by the adsorption of oxygen, the adsorption of cesium and the coadsorption of oxygen and cesium [NASA-TT-F-16364] N75-23725

Investigation of the galvanomagnetic properties of graphite in magnetic fields up to 500 kOe at low temperatures [NASA-TT-F-16387] N75-23787

Heat recovery systems for industrial furnaces, particularly coke ovens [NASA-TT-F-16400] N75-23889

Photometry in the 3200-9000 A range on board the Mars-5 automatic interplanetary station [NASA-TT-F-16347] N75-23923

Studies on measuring ultrasonic flow with the aid of the Doppler effect [NASA-TT-F-16393] N75-23928

Modern analytical measuring instruments [NASA-TT-F-16394] N75-23929

Soyuz-16: Biological experiments [NASA-TT-F-16356] N75-24293

Some procedural problems in automatic analysis of electrocardiograms [NASA-TT-F-16357] N75-24316

Problems of space biology. Volume 26: Statistical analysis of the cardiac rhythm and hemodynamic indices in physiological research [NASA-TT-F-16196] N75-24324

On the generalization of Kirchhoff formula [NASA-TT-F-16332] N75-24430

Organic analysis by nuclear magnetic resonance [NASA-TT-F-16276] N75-24446

Initial operation of Siemens superconducting prototype magnet W VII at the Plasma Physics Institute [NASA-TT-F-16291] N75-24479

Investigation of new dielectrics for miniaturized high-performance capacitors [NASA-TT-F-16383] N75-24506

Measurements of ion fluxes using RIEP-2801 M instrument on board Mars-4 and Mars-5 automatic interplanetary stations [NASA-TT-F-16352] N75-24606

Investigation of solar plasma near Mars and on Earth-Mars path by means of a charged-particle trap aboard Soviet spacecraft, 1971 - 1973. Part 3: Characteristics of plasma ion and electron components in the antisolar part of near-Martian space measured by Mars-5 [NASA-TT-F-16351] N75-24611

Measurement of intensity and spectral characteristics of radiation in the Lyman-alpha line in the upper Martian atmosphere [NASA-TT-F-16339] N75-24612

Preliminary results of measuring water vapor content in planetary atmosphere from measurements on board the Mars-5 automatic interplanetary station [NASA-TT-F-16337] N75-24613

Magnetic field of the planet Mars based on Mars-3 and Marsa5 satellite data
[NASA-TT-F-16350] N75-24614
Preliminary results of research conducted aboard the Soviet Mars-4, Mars-5, Mars-6, and Mars-7 planetary probes
[NASA-TT-F-16333] N75-24615
Experimental measuring composition of Martian atmosphere on board the descent module of the Mars-6 space station
[NASA-TT-F-16335] N75-24616
Martian atmosphere in the landing site of the descent module of Mars-6 [preliminary results]
[NASA-TT-F-16336] N75-24617
Ozone in the planetary atmosphere from measurements on board the Mars-7 automatic interplanetary station
[NASA-TT-F-16338] N75-24618
Polarimetric experiment on board Mars-5
[NASA-TT-F-16348] N75-24619
Spectrophotometry of Mars in the 2-5 micrometer range on board the Mars-5 automatic interplanetary station
[NASA-TT-F-16345] N75-24620
Infrared radiometry on board Mars-5
[NASA-TT-F-16344] N75-24621
Results of geologo-morphological analysis of some photographs of the Martian surface obtained by the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16343] N75-24622
Instrumentation and some results of photographic study on board the Mars-4 and Mars-5 automatic stations
[NASA-TT-F-16342] N75-24623
Results of investigating the Martian atmosphere by radio-occultation using the Mars-2, Mars-4, and Mars-6 craft
[NASA-TT-F-16341] N75-24624
Preliminary results of two-frequency radio-occultation of the Mars ionosphere by means of Mars planetary probes in 1974
[NASA-TT-F-16340] N75-24625
Some results of investigation of solar cosmic rays on board Mars-7 station
[NASA-TT-F-16353] N75-24645

KANSAS STATE UNIV., MANHATTAN.
Mathematical simulation of an adsorber for pollutant removal
[PB-239331/2] N75-24194

KAPTEYN ASTRONOMICAL LAB., GRONINGEN [NETHERLANDS].
On the structure of M17S
N75-24563
Multicolour far-infrared photometry of the galactic centre region
N75-24586
Infrared radiation model for the galactic centre
N75-24587

KAPTEYN ASTRONOMICAL LAB., RODEN [NETHERLANDS].
The dominant 10 to 20 micrometer source in the galactic centre
N75-24585

KENTUCKY DEPT. OF HIGHWAYS, LEXINGTON.
Slope stability analysis: A computerized solution of Bishop's simplified method of slices
[PB-238954/2] N75-24548

KENTUCKY WATER RESOURCES INST., LEXINGTON.
Hydraulic and flow studies related to sediment transport, Kentucky River, Kentucky
[PB-239259/5] N75-24092

KIRUNA GEOPHYSICAL OBSERVATORY [SWEDEN].
Kiruna geophysical data
[REPT-74/7-9] N75-24214
Kiruna geophysical data
[REPT-74/10-12] N75-24215

KITT PEAK NATIONAL OBSERVATORY, TUCSON, ARIZ.
The Orion nebula: A photographic study of spatial structure
N75-24556

KONINKLIJKE/SHELL-LABORATORIUM, AMSTERDAM [NETHERLANDS].
Determination of transverse weld yield strength on thin plate
[AMSR.0039.74] N75-24039

KVB ENGINEERING, INC., TUSTIN, CALIF.
Field testing: Application of combustion modifications to control pollutant emissions from industrial boilers, phase 1
[PB-238920/3] N75-24185

L

LABORATOIRE D'AUTOMATIQUE ET D'ANALYSE DES SYSTEMES, TOULOUSE [FRANCE].
Numerical control of a turbomachine
N75-23590

LABORATOIRES D'ELECTRONIQUE ET DE PHYSIQUE APPLIQUEE, PARIS LIMEIL-BREVANNES [FRANCE].
Solid state camera
[MB/MC-GD-2036/73] N75-23917
Performance improvement of a field effect transistor with Schottky barrier on GaAs
[MB/DL-CRL-32/43] N75-24500

LECCE UNIV. [ITALY].
Expected infrared molecular lines from the galactic centre
N75-24591

LEHIGH UNIV., BETHLEHEM, PA.
Material characterization of the fracture of filament, reinforced composites
[AD-A007386] N75-23717
Fracture toughness of bridge steels, phase 2 report
[PB-239188/6] N75-23774
Densification-mechanism modeling of the pressure-sintering behavior of MgAl2O4
N75-23984
Water-base coatings
[AD-A007851] N75-24011
Measurement of several rate coefficients for the He-Ne laser plasma
N75-24472

LEIDEN UNIV. OBSERVATORY [NETHERLANDS].
A high-resolution study of the H2 region W 3[OH]
N75-24571
OH and the earliest evolution of H2 regions
N75-24573

LES APPLICATIONS DE ROULEMENT, THOMERY [FRANCE].
On the effects of solid lubrication on the torque of a ball bearing
N75-24000

LIGHTNING ELIMINATION ASSOCIATES, DOWNEY, CALIF.
Design recommendation for a lightning elimination system for FAA category 3 instrument landing system, NAFEC, Atlantic City, New Jersey
[AD-A008933] N75-23609

LIGNES TELEGRAPHIQUES ET TELEPHONIQUES, CONFLANS-SAINTE-HONORINE [FRANCE].
Possible improvements to HF devices derived from irradiative control of the diffusion processes
[DTCE/3096] N75-24499

LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
A preliminary design of a TDMA system for FLEETSAT
[AD-A007823] N75-23829
Research for preparation of cation-conducting solids by high-pressure synthesis and other methods
[NASA-CR-134836] N75-24504

LINKABIT CORP., SAN DIEGO, CALIF.
Design of a digital voice data compression technique for orbiter voice channels
[NASA-CR-141790] N75-23820

LITTLE [ARTHUR D.], INC., CAMBRIDGE, MASS.
Feasibility study of a satellite solar power station
[NASA-CR-2357] N75-23683
Space satellite power system
[NASA-CR-142799] N75-24099

LND, INC., OCEANSIDE, N.Y.
Production engineering measure for high range Geiger Mueller tube
[AD-A007258] N75-23944

LOCKHEED MISSILES AND SPACE CO., HUNTSVILLE, ALA.
HF/DF chemical laser performance modification by chemical additives
[AD-A007263] N75-23976

LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Elements of address and adaptive radio telemetry systems, chapter 8
N75-23822
Some methods of receiving polarization modulation signals, chapter 6
N75-23823
Principles for the construction of polarization converters and modulators, chapter 3
N75-23824
Converter of non-electrical into electrical quantities, chapter 2
N75-23854
On the question of induced Mossbauer gamma radiation
N75-23966
Questions of the kinetics of stimulated gamma radiation
N75-23967
On the effect of a pressure wave on a spherical shell
N75-24036
Thermal mechanism of the switching effect in oxidized vanadium
N75-24508
New observations of H2 regions at 7.875, 15.5, 31.4, or 85 GHz
N75-24569

LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.
Experimental study of model size effects on cavitation and ventilation of surface piercing struts
[AD-A006672] N75-23896

LOCKHEED-CALIFORNIA CO., BURBANK.
Conceptual design study of advanced acoustic composite nacelle
[NASA-CR-132649] N75-23568

LOS ALAMOS SCIENTIFIC LAB., N.MEX.
Neutron diffraction studies of deuterium solid structures and transitions
[LA-UR-74-1716] N75-23788
KACHINA: An eulerian computer program for multifield fluid flows
[LA-5680] N75-23893
Calculations of laser induced spall in aluminum targets
[LA-5619-MS-REV] N75-23968
Modelocked, multiline pulsed CO2 oscillator
[LA-5839-MS] N75-23971
Carbon dioxide laser development and asymmetry in laser driven implosions
[LA-UR-74-1883] N75-23972

LOUGHBOROUGH UNIV. OF TECHNOLOGY [ENGLAND].
Construction of a dynamic airport system
[TT-7408] N75-23612
Design of high speed moving pavements for mass transit
[TT-7410] N75-24545

LOUISIANA STATE UNIV., BATON ROUGE.
Development of a three-dimensional time-dependent flow field model
[NASA-CR-120762] N75-24070

LTV AEROSPACE CORP., DALLAS, TEX.
Subsonic base and boattail drag, an analytical approach
N75-23492
Isolating nozzle afterbody interaction parameters and size effects: A new approach
N75-23503

LUCAS AEROSPACE LTD., BIRMINGHAM [ENGLAND].
Use of simulation in the design, development and testing of power plant control systems
N75-23595
The use of digital control for complex power plant management
N75-23596

M

MACHLETT LABS., INC., STAMFORD, CONN.
Electron beam semiconductor device with mesa diode, reliability and failure determination
[AD-A007277] N75-23860

MARCONI SPACE AND DEFENCE SYSTEMS LTD., CAMBERLEY [ENGLAND].
Development of new space lubricants
N75-23997

MARTIN MARIETTA CORP., DENVER, COLO.
Acquisition system environmental effects study
[NASA-CR-120768] N75-23684
Analysis of Skylab fluid mechanics science demonstrations
[NASA-CR-120765] N75-23888

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Study of alloy strengthening due to atomic order
[ORO-3935-43] N75-23769
The national solar energy program
N75-24102
Proceedings of the Solar Thermal Conversion Workshop
[PB-239277/7] N75-24157
Real-time characterization of particles emitted by coal-fired power generating plant
N75-24160
A note on irreducibility for linear operators on partially ordered finite dimensional vector spaces
[PB-239382/5] N75-24426

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
The development of experimental techniques for the study of helicopter rotor noise
[NASA-CR-137684] N75-23611
Analysis of thermal stresses and metal movement during welding
[NASA-CR-120757] N75-23754
Critical potentials for stress corrosion cracking [mechanism of stress corrosion cracking]
[AD-A007273] N75-23778
Energy system modeling-interfuel competition
[PB-239292/6] N75-24140
MIT sea grant: Using the seas to serve people
[COM-75-10269/9] N75-24292
An asynchronous logic array
[PB-238681/1] N75-24374
Electronic tunneling and structure of superconducting niobium single crystals
[AD-A007580] N75-24515
Evaluation of policy related research in the field of municipal solid waste management
[PB-239375/9] N75-24547

MASSACHUSETTS UNIV., AMHERST.
Oceanic and atmospheric energy sources
N75-24101
Variations in heat exchanger design for ocean thermal difference power plants
[PB-238572/2] N75-24134
A preliminary technology assessment of ocean thermal gradient energy generation
[PB-238646/4] N75-24147

MATERIALS SCIENCES CORP., BLUE BELL, PA.
Combined stress effects upon failure of fiber composites
[AD-A007352] N75-23716

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Molecular lasers in E-beam stabilized discharges
[AD-A007577] N75-23980

MATHEMATICS AND COMPUTATION LAB., MCLEAN, VA.
READY 1 system for the UNIVAC 1108 weapons effect program
[PB-239293/4] N75-24666
READY 1 system for the UNIVAC 1108 weapons preparation program
[PB-239294/2] N75-24667
READY 1 system for the UNIVAC 1108 attack conditions program
[PB-239295/9] N75-24668

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N75-24564

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HEOS 2 plasma observations in the distant polar magnetosphere: The plasma mantle
[MPI-PAE/EXTRATERR-108] N75-24207
Drift wave instabilities in plasmas with shear flow
[MPI-PAE/EXTRATERR-106] N75-24476

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Recent radio observations of the galactic centre
N75-24588

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[MPIS-MITT-59] N75-23516

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Evaluation of dispersion strengthened nickel-base alloy heat shields for space shuttle application
[NASA-CR-132615] N75-23667
Consideration of failure modes in the design of composite structures
N75-23710
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[NASA-CR-120725] N75-24526

MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
Manual control in target tracking tasks as a function of controller characteristics: A flight stimulator investigation, phase 2
[AD-A007384] N75-24368
Study of the modifications needed for efficient operation of NASTRAN on the Control Data Corporation STAR-100 computer
[NASA-CR-132644] N75-24382

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[MBL-1975-4] N75-24311
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 2: Studies on the specificity of initiation of transcription
[MBL-1975-5] N75-24312
In vitro synthesis of enzymes of the tryptophan operon of Escherichia coli. Part 3: Evidence for positive control of transcription
[MBL-1975-6] N75-24313
A changed ATP-dependent DNAase: The characterization of the enzyme from Escherichia coli rorA
[MBL-1974-38] N75-24314
The influence of ionizing radiation on the immune response
[MBL-1974-28] N75-24329
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NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C.

Thermophysical properties of matter and substances, Volume 2
[TT-72-52001-VOL-2] N75-23738
Abstract reports: Presented at the Meetings of the American Association for the Advancement of Science
[PB-239273/6] N75-24523
Abstract reports: Presented at the meetings of the American Association for the Advancement of Science, May - December 1972
[PB-239274/4] N75-24538

NATIONAL SEVERE STORMS LAB., NORMAN, OKLA.

Updraft properties deduced from Rawinsoundings
[COM-75-10193/1] N75-24240
Mesonetwork array: Its effect on thunderstorm flow resolution
[COM-75-10248/3] N75-24257

NATIONAL WEATHER SERVICE, SILVER SPRING, MD.

Operations of the National Weather Service, 1974
[COM-75-10194/9] N75-24239
River forecasts provided by the National Weather Service. Volume 2: 1973
[COM-75-50005/8] N75-24243
SPLASH programs user's guide
[COM-75-10181/6] N75-24288

NATIONAL WEATHER SERVICE, STERLING, VA.

Evaluation of a Digital Display System [DDS] driven by an Automatic Meteorological Observing System AMOS 3-70
[AD-A008898] N75-23546

NAVAL AEROSPACE MEDICAL RESEARCH LAB., PENSACOLA, FLA.

Computer measurement of complex performance
N75-24300
Impact of multivariate analysis on the aviation selection and classification process
N75-24306

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.

Flight test for the feasibility evaluation of the Chadwick Electronic Weighing System [CHEWS]
[AD-A007516] N75-23522
A crashworthy armored pilot seat for helicopters
[AD-A007551] N75-23541
A pilot/LSO simulation conducted to investigate aircraft wave-off performance and to determine the ability of the landing signal officer to judge aircraft approaches
[AD-A007515] N75-24356

NAVAL BIOMEDICAL RESEARCH LAB., OAKLAND, CALIF.

Studies on propagation of microbes in the airborne state
[NASA-CR-142757] N75-24294
Studies on possible propagation of microbial contamination in planetary atmospheres
[NASA-CR-142825] N75-24296

NAVAL ELECTRONICS LAB. CENTER, SAN DIEGO, CALIF.

Aluminum ribbon and round wire bonding: Comparative analysis
[AD-A007513] N75-23777
Integrated optical circuit devices
[AD-A007512] N75-24471

NAVAL INTELLIGENCE SUPPORT CENTER, WASHINGTON, D.C.

Wing longitudinal stability criteria
[AD-A007430] N75-23527
Hydroaerodynamic characteristics of a low aspect ratio delta wing near a screen
[AD-A007649] N75-23529
Passive Radar
[AD-A007651] N75-23828
Passive Radar
[AD-A007438] N75-23830
Thermodynamics of liquid metal MHD converters
[AD-A007415] N75-24141

NAVAL ORDNANCE LAB., WHITE OAK, MD.

A method for the separation of oil from an aqueous oil, detergent solution prior to IR analysis, part 2
[AD-A006826] N75-24188

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.

Aerodynamic characteristics of an axisymmetric body undergoing a uniform pitching motion
[AD-A007553] N75-23523
Linearization of FM-CW radar sweep by feedback
[AD-A007867] N75-23551
A high frequency platinum resistance thermometer system for measuring turbulent atmospheric temperature fluctuations
[AD-A007284] N75-23951

Estimation of mixing ratio profiles over maritime areas by linear regression methods
[AD-A007654] N75-24217
Spectral analysis of the energy exchange at OWS NOVEMBER
[AD-A007484] N75-24286
Optimal Synthesis Program for Automatic Control [OSPAC]
[AD-A007550] N75-24416

NAVAL RESEARCH LAB., WASHINGTON, D.C.
Characteristics of crack propagation at the interface between two dissimilar media, phase 1
[AD-A007293] N75-23714
A method for determining oil in water
[AD-A007871] N75-23734
A simplified technique for phase control of conformal arrays
[AD-A007486] N75-23835
A broadband digital diode phase shifter using a matrix interconnection of quadrature hybrid couplers, phase 1
[AD-A007294] N75-23864
An indirect method for measuring surface based temperature inversions
[AD-A007872] N75-23950
A computer code for time dependent recombination lasers
[AD-A007292] N75-23975
Nonlinear acoustics. Part 1: Physical phenomena, exact basic equations, and problems in formulation and solution of approximate equations
[AD-A002997] N75-24434
Non-linear stabilization of beam plasma interactions by parametric effects
[AD-A007487] N75-24488
Report of NRL progress
[PB-238901/3] N75-24663
Report of NRL progress
[PB-238839/5] N75-24664

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, BETHESDA, MD.
Hydrodynamic stability evaluation of an 0.088-scale solid rocket booster model
[AD-A007477] N75-23686
CGR: An improved computerized model to predict fatigue crack growth under spectrum loading
[AD-A007481] N75-24043

NAVAL SUBMARINE MEDICAL RESEARCH LAB., GROTON, CONN.
Shallow Habitat Air Dive series [SHAD 1 and 2]: The effects on visual performance and physiology
[AD-A007104] N75-24342

NAVAL UNDERSEA CENTER, SAN DIEGO, CALIF.
Ocean engineering
[AD-A007297] N75-23812
A maximum entropy filter
[AD-A007482] N75-23834
High resolution spectral analysis with arbitrary spectral centers and adjustable spectral resolutions
[AD-A007483] N75-23838

NAVAL WEATHER SERVICE COMMAND, WASHINGTON, D.C.
Summary of synoptic meteorological observations Caribbean and nearby island coastal marine areas. Volume 2: Area 7 - Cayman, area 8 - Jamaica west, area 9 - Jamaica south, area 10 - Jamaica north, area 11 - Jamaica south-east
[AD-A001031] N75-24235
Summary of synoptic meteorological observations Caribbean and near by island coastal marine areas. Volume 4: Areas 18 - Hispaniola north, area 19 - Santo Domingo, area 20 - Mona Passage, area 21 - Puerto Rico south, area 22 - Puerto Rico north, area 23 - Vieques
[AD-A001457] N75-24236
Summary of synoptic meteorological observations. North American coastal marine areas, revised. Atlantic and Gulf Coasts. Volume 1. Revised. Area 1: Belle Isle Strait. Area 2: Osv Bravo. Area 3: NE Newfoundland coast. Area 4: SE Newfoundland coast. Area 5: Placentia Bay south. Area 6: Cabot Strait. Area 7: Anticosti Island
[AD-A006990] N75-24237
Summary of synoptic meteorological observations. Indonesian coastal marine areas, volume 1. Area 1: Southeast Sumatra. Area 2: Christmas Island. Area 3: Sunda Strait. Area 4: Northeast Java Sea. Area 5: Bangka Island northeast. Area 6: Natuna Island. Area 7: Sarawak
[AD-A006923] N75-24242
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 3: Area 12, Hispaniola South; area 13, Windward Passage; area 14, Grand Bahama; area 15, Nassau; area 16, San Salvador; area 17, Acklins Island
[AD-A001912] N75-24244
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 5: Area 24, Virgin Islands; area 25, Leeward Islands; area 26, Winward Islands; area 27, Trinidad; area 28, Barcelona; area 29, Caracas
[AD-A001918] N75-24245
Summary of synoptic meteorological observations: Caribbean and nearby island coastal marine areas. Volume 6: Area 30, Gulf of Venezuela, area 31, Riohacha; area 32, Cartagena; area 33, Colon; area 34, Gulf of Panama; area 35, Galapagos islands
[AD-A001973] N75-24246

NAVAL WEATHER SERVICE DETACHMENT, ASHEVILLE, N.C.
Bermuda environmental scenario
[AD-A007448] N75-24253

NEBRASKA UNIV., LINCOLN.
Vibrational intensity distributions for continuum photoionization of oxygen
[NASA-CR-142748] N75-24438

NEDERLANDS SCHEEPS-STUDIECENTRUM TNO, DELFT.
Wave induced motions and loads on ships in oblique waves
[REPT-193-S] N75-23810

NEVADA ENGINEERING AND TECHNOLOGY CORP., LONG BEACH, CALIF.
Correlation of materials properties with the atomic density concept
[NASA-CR-120751] N75-23727

NEW HAMPSHIRE UNIV., DURHAM.
Solar gamma ray monitor for OSO-H [0.3-10 MeV]
[NASA-CR-143799] N75-23922

NEW MEXICO STATE UNIV., LAS CRUCES.
Velocity variations of an Equatorial plume throughout a Jovian year
[NASA-CR-142894] N75-24639

NEW MEXICO STATE UNIV., UNIVERSITY PARK.
UHF multipath phenomena in a marine environment
[COM-75-10266/5] N75-23841

NEW ORLEANS UNIV., LA.
Electron laser-pulse scattering
N75-23961
Low temperature calorimetry of transition metal alloys
N75-24492

NEW YORK UNIV., N.Y.
Low speed injection effects on the aerodynamic performance at transonic speed
N75-23494
Plasma equilibria with closed magnetic field lines
N75-24474

NICE UNIV. [FRANCE].
Electron photon interactions in semiconductors
N75-24465

NIELSEN ENGINEERING AND RESEARCH, INC., MOUNTAIN VIEW, CALIF.
Analysis of wake vortex flight test data behind a T-33 aircraft
[NASA-CR-137669] N75-23482
Calculation of static longitudinal aerodynamic characteristics of STOL aircraft with upper surface blown flaps
[NASA-CR-137646] N75-23483

NORTH CAROLINA STATE DEPT. OF ADMINISTRATION, RALEIGH.
A man-machine procedure for extracting information from data collected by the Earth Resources Technology Satellite
[PB-238431/1] N75-24073

NORTH CAROLINA STATE UNIV., RALEIGH.
Unsteady stall of a slender elliptic cylinder in a freestream of sinusoidally varying angle of incidence
N75-23473
Characterization of nylon 66-poly[ethylene glycol] blend fibers
N75-23785
Optimal densification of ceramics by rate controlled sintering
[AD-A007339] N75-23792
Unsteady momentum integral analysis of the laminar boundary layer on an elliptic cylinder oscillating in pitch
N75-23878
An accelerated elimination technique for the solution of perturbed Hamiltonian systems
N75-24417
Nonlinear Couette flow problem in collisional plasmas
N75-24475

NORTHEASTERN ILLINOIS PLANNING COMMISSION, CHICAGO.
Biography on the planning aspects of air pollution control, summary and evaluation
[PB-238927/8] N75-24182

NORTHERN PRAIRIE WILDLIFE RESEARCH CENTER, JAMESTOWN, N. DAK.
Utilization of Skylab EREP system for appraising changes in continental migratory bird habitat
[E75-10281] N75-24054

NORTHROP CORP., HAWTHORNE, CALIF.
A criterion for prediction of airframe integration effects on inlet stability with application to advanced fighter aircraft
N75-23487
Holographic stereogram conversion program
[AD-A007786] N75-23952

NORTHWESTERN UNIV., EVANSTON, ILL.
A stochastic rainfall model and statistical analysis of hydrologic factors
[PB-238948/4] N75-24238

NOTRE DAME UNIV., IND.
Inelastic response of ring-stiffened cylindrical shells to external pressure shock waves
[AD-A007329] N75-24041

NOTTINGHAM UNIV. [ENGLAND].
Prediction of static and fatigue damage and crack propagation in composite materials
N75-23699

NUFFIELD RADIO ASTRONOMY LABS., JODRELL BANK [ENGLAND].
Radio recombination lines from carbon and heavier elements from the direction of NGC 2024
N75-24572
Observations of neutral hydrogen in the region 355 deg greater than l sup II greater than 10 deg and -5 deg greater than b sup II greater than 5 deg
N75-24589

O

OAK RIDGE NATIONAL LAB., TENN.
Effect of neutron irradiation on the microstructure and properties of titanium-stabilized type 316 stainless steels
[ORNL-TM-4731] N75-23973
Importance of validation in ecosystem analysis
[CONF-750202-2] N75-24047
Study of the application of HTGR to a petroleum refinery petrochemical complex
[CONF-741144-1] N75-24126
NSF-RANN energy abstracts. A monthly abstract journal of energy research
[ORNL-EIS-74-52-VOL-2-NO-6] N75-24532

OAK RIDGE Y-12 PLANT, TENN.
Direct digital numerical controller for machine tools
[Y-1966] N75-24373

OBSERVATOIRE DE PARIS-MEUDON [FRANCE].
Calculation of infrared spectra from dust in planetary nebulae
N75-24580

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS [FRANCE].
Interaction problems between air intakes and aircraft
N75-23486
Theory of mixing flow of a perfect fluid around an afterbody and a propulsive jet
N75-23493

OFFICE OF NAVAL RESEARCH, LONDON [ENGLAND].
European scientific notes. Volume 29 number 3
[AD-A007612] N75-24535

OFFICE OF OIL AND GAS, WASHINGTON, D.C.
Vulnerability of natural gas systems
[AD-A007583] N75-24143

OHIO DEPT. OF HIGHWAYS, COLUMBUS.
Investigation of the analytical stereoplotter AP/C [OP/C phase] in application to highway engineering projects
[PB-238461/..] N75-24091

OHIO STATE UNIV., COLUMBUS.
Field ion microscopic study of films of molybdenum, platinum and tantalum vapor deposited on tungsten
N75-23747
Corrosion fatigue of type 304 stainless steel in H2SO4 + NaCl at 25 C
N75-23748
The automatic acquisition of interesting objects in a cluttered image environment
N75-23815
Vibration analysis of skewed cantilever systems: Helicoidal shells and plates
N75-24026
Direct recovery of mean gravity anomalies from satellite to satellite tracking
N75-24201
Finite difference methods for transient signal propagation in stratified dispersive media
N75-24427
Minority carrier kinetics in defect trap distributions in semiconductors: Application to trigonal selenium single crystals
N75-24497

OKLAHOMA UNIV., NORMAN.
Variational optimization analysis of temperature and moisture advection in a severe storm environment
[NASA-CR-141794] N75-24228

OLD DOMINION UNIV. RESEARCH FOUNDATION, NORFOLK, VA.
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region
[NASA-CR-142820] N75-24120
Interdisciplinary study of atmospheric processes and constituents of the mid-atlantic coastal region. Attachment 3: Data set for Craney Island oil refinery installation experiment
[NASA-CR-142823] N75-24121
Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region.

Attachment 4: Data set for background investigation of atmospheric constituents for Nansemond River site [NASA-CR-142821] N75-24122

Interdisciplinary study of atmospheric processes and constituents of the mid-Atlantic coastal region. Attachment 5: Data set for background investigation of atmospheric constituents for Richmond, Virginia area [NASA-CR-142822] N75-24164

OPERATIONAL RESEARCH AND ANALYSIS ESTABLISHMENT, OTTAWA [ONTARIO].

Analysis of distress air cases in relation to crash position and intended track: 1968 - 1973 [AD-A007429] N75-23540

OREGON GRADUATE CENTER FOR STUDY AND RESEARCH, BEAVERTON.

Experimental pulsed laser, remote crosswind measurement system, feasibilty study and design, part 2 [AD-A007350] N75-23981

ORGANIZATION FOR HEALTH RESEARCH, TNO, AMSTERDAM [NETHERLANDS].

Changes in visual evoked response by non-visual task processing N75-24301

Pulse wave velocity over the vascular wall as a means for distinguishing between different psychophysiological reaction patterns to a mental task N75-24302

OSSERVATORIO ASTROFISICO DI ARCETRI, FLORENCE [ITALY].

The gas-to-dust ratio in the Orion nebula N75-24581

P

PADUA UNIV. [ITALY].

Nuclei and H2 regions in spiral galaxies: Preliminary results for M 101 N75-24575

PARIS UNIV. [FRANCE].

Characterization of implanted silicon by Raman and infrared spectrocopy N75-24013

SbSI physical properties near the ferroelectric phase change point N75-24501

PARSONS [RALPH M.] CO., PASADENA, CALIF.

Demonstration plant, clean boiler fuels from coal. Volume 3: Preliminary design/economics analysis [PB-238529/2] N75-24127

PEAT, MARWICK, MITCHELL AND CO., SAN FRANCISCO, CALIF.

Saint Louis aviation forecast study: Technical supplement [PB-239058/1] N75-23535

Saint Louis aviation forecast study: Review of prior forecasts [PB-239057/3] N75-23536

Saint Louis aviation forecast study [PB-239056/5] N75-23537

Saint Louis aviation forecast study: Executive summary [PB-239055/7] N75-23538

PEDCO-ENVIRONMENTAL SPECIALISTS, INC., CINCINNATI, OHIO.

Guidelines for air quality maintenance planning and analysis. Volume 3: Control strategies [PB-237582/2] N75-24170

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.

The distribution of jet source strength intensity by means of a direct correlation technique N75-23872

Transient operation of a steady state burner N75-24095

The role of ice particulates in the electrification of the air in the mesosphere N75-24202

Theory and practice of geophysical survey design N75-24203

Ionospheric research [NASA-CR-142830] N75-24210

Estimation with quantized measurements N75-24379

An investigation of the energy-momentum relations for the piezoelectric polaron N75-24437

The effect of anisotropy on the piezoelectric polaron N75-24489

PHILCO-FORD CORP., NEWPORT BEACH, CALIF.

Infrared gas filter correlation instrument for in-situ measurement of gaseous pollutants [PB-239467/4] N75-23956

PHILIPS GLOEILAMPENFABRIEKEN N. V., EINDHOVEN [NETHERLANDS].

Grease lubricated spiral groove bearings for long-life systems N75-24003

PIERBURG LUFTFAHRTGERAETE UNION G.M.B.H., NEUSS [WEST GERMANY].

A new lightweight fuel control system for electrical inputs N75-23599

PISA UNIV. [ITALY].

Fluidic sensors for turbojet engines N75-23598

POLISH ACADEMY OF SCIENCES, WARSAW.

Nonstationary heat exchange in a free molecular range N75-23870

POLYTECHNIC INST. OF NEW YORK, BROOKLYN.

Tactical communication systems [AD-A007260] N75-23833

PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.

Control design considerations for variable geometry engines N75-23583

PRINCETON UNIV., N.J.

The preparation and physical properties of polyester-poly [methyl methacrylates] triblock copolymers [AD-A007347] N75-23689

Concerning the nature of rubber glass: Transition of elastomeric materials [AD-A007348] N75-23796

PURDUE UNIV., LAFAYETTE, IND.

Computer-augmented design of aircraft wing structures N75-23554

Minimum-time rescue trajectories between spacecraft in circular orbits N75-23628

Determination of thermal properties of layer composites by flash method [PB-239114/2] N75-23718

Interstitial relaxations due to hydrostatic stress in niobium-oxygen alloys N75-23743

An analytical study of thermal turbulence N75-23876

Design, evaluation and applications of a vidicon rapid scanning spectrophotometer N75-23913

Estimation of structural dynamic model parameters from transient response data N75-24022

A finite element displacement approach for the elasto-plastic analysis of thin cylindrical shells N75-24023

Algebraic techniques for the analysis and design of digital filters N75-24370

Man-machine communications: An examination of the machines N75-24371

Application of computer controlled monitoring and data reduction to potentiometry and voltammetry N75-24380

Non-linear wave propagation in heterogeneous anisotropic plates N75-24428

Studies of the effects of radiations [COO-125-57] N75-24449

Focusing problems in wave propagation: A method based on almost plane waves N75-24461

Electrical transport properties in n GaSb under hydrostatic pressure N75-24496

Q

QUEEN MARY COLL., LONDON [ENGLAND].

One millimeter observations of H2 regions N75-24568

R

RADIO CORP. OF AMERICA, MOORESTOWN, N.J.

Power transistor reliability investigation [AD-A007587] N75-23862

RADIO CORP. OF AMERICA, PRINCETON, N.J.

Piezoelectric aluminum nitride films [AD-A007657] N75-24518

RADIO CORP. OF AMERICA, SOMERVILLE, N.J.

Total-dose radiation-hardened COS/MOS integrated circuits [AD-A007618] N75-23861

RADIOTECHNIQUES S. A., CAEN [FRANCE].

Preliminary studies for high tension integrated circuits [MDB/MD-3055] N75-23847

RAND CORP., SANTA MONICA, CALIF.

Parameterization of the planetary boundary layer in atmospheric general circulation models, a review [AD-A007579] N75-24251

RAYTHEON CO., BEDFORD, MASS.

Advanced helmet mounted sight study program [AD-A007874] N75-24366

RAYTHEON CO., SUDBURY, MASS.

Space vehicle Viterbi decoder [NASA-CR-141787] N75-23672

RAYTHEON CO., WALTHAM, MASS.

Electron beam semiconductor device with mesa diode, reliability and failure determination [AD-A007277] N75-23860

Casting of halide and flouride alloys for laser windows [AD-A007656] N75-24468

RCA LABS., PRINCETON, N.J.

Image descriptors for displays [AD-A007585] N75-24536

RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM [SWEDEN].

Search service on Government Reports Announcements [GRA] magnetic tapes at the Swedish National Defence Research Institute [FOA] [PB-238957/5] N75-24411

RESEARCH TRIANGLE INST., DURHAM, N.C.

A study of glow discharge polymerization as a means of modifying the surface of polymers [PB-239289/2] N75-23797

Guidelines for air quality maintenance planning and analysis. Volume 2. Plan preparation [PB-237581/4] N75-24169

Guidelines for air quality maintenance planning and analysis. Volume 3: Control strategies [PB-237582/2] N75-24170

Guidelines for air quality maintenance planning and analysis. Volume 8: Computer-assisted area source emission gridding procedure [PB-237585/5] N75-24174

Symposium proceedings: Environmental Aspects of Fuel Conversion Technology [PB-238304/0] N75-24179

REYNOLDS METALS CO., RICHMOND, VA.

Program to improve the fracture toughness and fatigue resistance of aluminum sheet and plate for aircraft applications, volume 2 [AD-A003417] N75-23775

RHODE ISLAND UNIV., KINGSTON.

Petroleum degradation in low temperature marine and estuarine environments [AD-A007588] N75-24191

Tides and tidal currents of Narragansett Bay [COM-75-10250/9] N75-24290

ROCKETDYNE, CANOGA PARK, CALIF.

Hydrazine gas generator program [NASA-CR-141795] N75-23680

ROCKWELL INTERNATIONAL CORP., LOS ANGELES, CALIF.

Design and analysis of a supersonic penetration/maneuvering fighter [NASA-CR-132633] N75-23558

ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.

Identification and interpretation of tectonic features from Skylab imagery [E75-10288] N75-24061

ROLLS-ROYCE, LTD., DERBY [ENGLAND].

A model technique for exhaust system performance testing N75-23502

Control system requirements dictated by optimization of engine operation N75-23579

ROLLS-ROYCE, LTD., WATFORD [ENGLAND].

Helicopter engine control: The past 20 years and the next N75-23585

ROME AIR DEVELOPMENT CENTER, GRIFFISS AFB, N.Y.

FAA lightning protection study: Lightning protection requirements for AIL type 55 K instrument landing system [AD-A008931] N75-23530

FAA lightning protection study: Lightning protection requirements for Wilcox mark 1/A instrument landing system [AD-A008934] N75-23545

ROME UNIV. [ITALY].

Low speed injection effects on the aerodynamic performance at transonic speed N75-23494

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCES, MIAMI, FLA.

Analysis of ERTS-A satellite photos for NOAA-AOML study to detect ocean eddies [sic] [COM-75-10192/3] N75-24282

ROYAL AIR FORCE CENTRAL MEDICAL ESTABLISHMENT, LONDON [ENGLAND].

Sixteen years experience in military aviation psychiatry and neurology N75-24309

ROYAL AIR FORCE INST. OF AVIATION MEDICINE, FARNBOROUGH [ENGLAND].

Some fast analytical techniques for the EEG N75-24305

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH [ENGLAND].

The subsonic base drag of cylindrical twin-jet and single-jet afterbodies N75-23498

Fracture behaviour and residual strength of carbon fibre composites subjected to impact loads
N75-23706
Development of new space lubricants
N75-23997
Residual stresses in notches produced by variable operational loads and their importance for the application of the linear cumulative damage hypothesis
[RAE-LIB-TRANS-1800] N75-24033
Employment of the fast Fourier transform in digital filters
[RAE-LIB-TRANS-1834] N75-24384

ROYAL INST. OF TECH., STOCKHOLM [SWEDEN].
The balance of rotating plasma slabs
[TRITA-EPP-74-19] N75-24482
The flux of particle loss in a permeable plasma
[TRITA-EPP-74-20] N75-24483
Electron plasma oscillations in a static electric field
[TRITA-EPP-74-21] N75-24484
On tornado traps operated as rotating plasma devices
[TRITA-EPP-74-22] N75-24485
Plasma equilibrium in external ring systems
[TRITA-EPP-74-23] N75-24486

ROYAL OBSERVATORY, EDINBURGH [SCOTLAND].
Galactic structure at 12 equals 40 deg
[SBN-902553-11-9] N75-24609

S

SANDIA LABS., ALBUQUERQUE, N.MEX.
Characterization of unsteady gas discharge from a vessel
[SAND-75-8207] N75-23892
Probes for density measurements of F2, HF, and DF in continuously operating chemical lasers
[SAND-74-0432] N75-23970
Spheroidization of normal and deuterated polyethylene
[SAND-74-0318] N75-23996
Unmanned seismological observatory: Seismometers and signal processing
[SAND-74-0205] N75-24213
Proceedings of the Symposium on Digital Signal Processing
[SAND-74-8672] N75-24372
Computational techniques for boundary layers
[SAND-74-5821] N75-24420

SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Laboratory assessment of pilot performance using nonrated subjects at three alcohol dose levels
[AD-A007727] N75-24349

SCIENCE APPLICATIONS, INC., ARLINGTON, VA.
A tunable dye laser diagnostic facility
[AD-A007620] N75-23979

SCIENTIFIC TRANSLATION SERVICE, SANTA BARBARA, CALIF.
High-capacity transport planes as modern air freight systems
[NASA-TT-F-16396] N75-23533
Preparation and properties of tungsten-wire reinforced NiCr 80-20
[NASA-TT-F-16275] N75-23696
X-ray analysis of metal traces in petroleums using ion exchange membranes
[NASA-TT-F-16288] N75-23724
Diffusion layers formed in salt media and molten oxides
[NASA-TT-F-16381] N75-23757
Functioning of power rectifiers and thyristors from 1 January 1970 to 31 December 1972, noting carrier injection, emitter shorts, ignition, and breakdown
[NASA-TT-F-16365] N75-23830
Investigation of effects of vibration on a structure
[NASA-TT-F-16305] N75-23926
French participation in the EXAMETNET program operational implementation
[NASA-TT-F-16388] N75-24230
Physics of the sea and atmosphere
[NASA-TT-F-16225] N75-24262
Recent changes in the ocean level
N75-24263
Coastal upwelling on the east of the tropical zone of the North Atlantic and its relation to the stability of the northeast tradewind
N75-24264
Drift current in a thin surface layer of the ocean
N75-24265
The role of large-scale atmospheric circulation in the formation of temperature anomalies in surface waters as illustrated by the northern part of the Pacific Ocean
N75-24266
Solar activity and the motions of the upper atmosphere
N75-24267
Microconvection in evaporation and microconvection in ice formation
N75-24268
The D sub m[kappa, alpha 1..., alpha sub m function in the ocean-continent transfer problem
N75-24269
Determining the parameters of the prognostic operator for undamped fluctuations by the use of the D sub m[kappa; alpha 1,..., alpha sub m]
N75-24270
Temperature fields of an absorptive medium in a radiating system of arbitrary configuration [the spatial problem]
N75-24271
Calculation of the radiative heat exchange in a conical cavity of complex configuration with an absorptive medium
N75-24272
An example of the use of laboratory results in the optics of the sea
N75-24273
Some new methods of determining and studying the absorptivity of a medium and the generalized angular coefficients of radiation
N75-24274
Some results of the hydrodynamic theory of finite-amplitude waves
N75-24275
Calculations of the heights, periods, profile parameters, and energy spectra of wind waves
N75-24276
Temperature waves in a stratified sea
N75-24277
Long-distance recording of the humidity over the sea
N75-24278
Physical nature of the climatic and biological effects of the Peru current
N75-24279
Distribution of energy in the ocean and atmosphere as a result of their thermal and dynamic interactions
N75-24280
On bottom density currents on the continental shelves
N75-24281
Several question of the phylogeny and system of lacertilia [seu sauria]
[NASA-TT-F-16354] N75-24295
Spinal effects of an electrical vestibular stimulation in man
[NASA-TT-F-16314] N75-24318
Hot air sterilization
[NASA-TT-F-16384] N75-24320
Biological experiments on Salyut-4
[NASA-TT-F-16267] N75-24321
The testing of peripheral vision
[NASA-TT-F-16312] N75-24322
On rod visual acuity and cone visual acuity
[NASA-TT-F-16315] N75-24323
Effects of muscular exercise on variation in plasma cortisol and glucose in normal males
[NASA-TT-F-16257] N75-24326
Center for Technical Submarine Studies and Research
[NASA-TT-F-16385] N75-24361

SHOCK HYDRODYNAMICS, INC., SHERMAN OAKS, CALIF.
Non-linear fracture mechanics: New theories of solid propellant response and fracture behaviors
[AD-A007334] N75-23800

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Compact infrared sources associated with southern H2 regions
N75-24560
High-resolution maps of H2 regions at far-infrared wavelengths
N75-24567
A table of semiempirical gf values. Part 1: Wavelengths: 5.2682 nm to 272.3380 nm
[NASA-CR-142879] N75-24599
A table of semiempirical gf values. Part 2: Wavelengths: 272.3395 nm to 599.3892 nm
[NASA-CR-142880] N75-24600
A table of semiempirical gf values. Part 3: Wavelengths: 599.4004 nm to 9997.2746 nm
[NASA-CR-142881] N75-24601

SOCIETE NATIONALE D'ETUDE ET DE CONSTRUCTION DE MOTEURS D'AVIATION, MELUN [FRANCE].
Research about effects of external flow and aircraft installation conditions on thrust reversers performances
N75-23495
Simulation techniques for turbomachines
N75-23591

SOCIETE NATIONALE D'ETUDE ET DE CONSTRUCTION DE MOTEURS D'AVIATION, VILLAROCHE [FRANCE].
Evolution of turboreactor control systems
N75-23588

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, LES MUREAUX [FRANCE].
Research and development in the field of spacecraft mechanical devices
N75-24007

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Development of a bench procedure for evaluating the effectiveness of dispersant detergent gasoline additives, phase 2
[AD-A006580] N75-24018

SPECTROLAB, INC., SYLMAR, CALIF.
Photovoltaic solar power systems
N75-24098

SPERRY RAND CORP., CLEARWATER, FLA.
Failure analysis of electronic parts: Laboratory methods
[NASA-SP-6508] N75-23853

SPERRY RAND CORP., NEW YORK.
Experimental investigation and model development of the Skylab ATM secondary nickel-cadmium batteries
[NASA-CR-120749] N75-24097

STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Proceedings of the 9th International Conference on High Energy Accelerators
[CONF-740522] N75-24448

STANFORD RESEARCH INST., MENLO PARK, CALIF.
Radiation of electromagnetic walsh, waves, part 2
[AD-A007067] N75-23825
Improved suppression of radiation from automobiles used by the general public
[PB-239471/6] N75-24553

STANFORD UNIV., CALIF.
Complementary MOS transistors in micropower circuits
[AD-A007272] N75-23839
A survey of the development of thermo-viscoelastic stress analysis
[AD-A007561] N75-24045
Applied research on 2 - 6 compound materials for heterojunction solar cells
[PB-239184/5] N75-24146
Health care and satellite radio communication in village Alaska
[PB-238742/1] N75-24343
Automatic program verification 3: A methodology for verifying programs
[AD-A007563] N75-24398
Some experiments on the accuracy of three methods of updating the inverse in the simplex method
[AD-A007148] N75-24399
Development of chalcopyrite crystals for nonlinear optical applications
[AD-A007838] N75-24469
Ionisation structure and transfer of radiation in dusty nebulae
N75-24578

STATE UNIV. OF NEW YORK, ALBANY.
Evolutionary characteristics of a bimodal grain model
N75-24576
Dust in the galactic center
N75-24584

STATE UNIV. OF NEW YORK, STONY BROOK.
Carbon monoxide mapping of 100 micrometer sources associated with dark clouds: Preliminary results
N75-24582

STEVENS INST. OF TECH., HOBOKEN, N.J.
Nonstationary aerodynamics of arbitrary cascades in compressible flow
N75-23474

STRATHCLYDE UNIV., GLASGOW [SCOTLAND].
Optical strain recording, analysis of strain histories in structures
[AD-A007829] N75-23948

STRUCTURES RESEARCH ASSOCIATES, LAGUNA BEACH, CALIF.
Computer analysis of multicircuit shells of revolution by the field method
[NASA-CR-2535] N75-24037

SUSSEX UNIV., BRIGHTON [ENGLAND].
Optical, infrared and radio observations of two H2 regions
N75-24559

SYRACUSE UNIV., N.Y.
A chemical bond approach to metals and alloys
N75-23744
Surface studies of cobalt alloys in ultra high vacuum utilizing contact resistance
N75-23745
Perturbation techniques for directivity optimization of Yagi-Uda arrays
N75-23813
Glass-Si heterojunction solar cells
[PB-239282/7] N75-24156
A discrete simulation model of the revised AFMPC IOC microform system
[AD-A007776] N75-24537

SYRACUSE UNIV., UTICA, N.Y.
Contact resistance studies of sintering using ultra clean copper surfaces in ultra high vacuum
N75-23983
A new model for the threshold condition for initiation and propagation of fatigue cracks
N75-24025

SYSTEM DEVELOPMENT CORP., SANTA MONICA, CALIF.
Comprehensive technical report on all atmospheric contaminants associated with photochemical air pollution
[PB-239510/1] N75-24197
SYSTEMS APPLICATIONS, INC., SAN RAFAEL, CALIF.
Mathematical simulation of smog chamber photochemical experiments
[PB-238094/7] N75-24180
SYSTEMS CONTROL, INC., PALO ALTO, CALIF.
Electric power systems analysis research
[PB-239236/3] N75-24139
SYSTEMS SCIENCE AND SOFTWARE, LA JOLLA, CALIF.
Effects of meso-scale and small scale interactions on global climate. Volume 1: Orographic effects on global climate
[AD-A007034] N75-24247
Meso-scale and small-scale interactions on global climate. Volume 2: Radiation transport effects on global climate
[AD-A007035] N75-24248

T

TECHNION - ISRAEL INST. OF TECH., HAIFA.
Fatigue properties of aircraft lugs with interference fit
[TAE-243] N75-24031
Prediction of physiological respones to work, environment and clothing
[AD-A007282] N75-24348
TECHNISCHE HOGESCHOOL, DELFT [NETHERLANDS].
A multi-disciplinary team for the treatment of patients with defect upper extremities: A need for optimal rehabilitation
[WTHD-67] N75-24325
On the acceptance, functional gain and mental load in arm prosthesis and orthosis control
[WTHD-66] N75-24355
The lightspot operated typewriter: The evaluation of a prototype
[WTHD-65] N75-24364
Electromagnetic fields generated by turbulent air flow and shock waves
[WTHD-68] N75-24431
TECHNISCHE UNIV., BERLIN [WEST GERMANY].
Stress and strength analysis of reinforced plastic with holes. Consequences on design
N75-23705
TECHNISCHE UNIVERSITAET, MUNICH [WEST GERMANY].
Anomalous Hall effect in metals with small concentrations of localized magnetic defects
N75-23750
Research on the influence of dislocations on the diffraction of X rays and gamma rays on copper single crystals
N75-23751
The problem of integration in the cybernetic system theory of Karl Deutsch
N75-24521
TECIMAR S.A.R.L., PARIS [FRANCE].
Studies and research on marine hulls working with natural ground effect
N75-23475
TELEDYNE MICRONETICS, SAN DIEGO, CALIF.
Passive ranging with wavefront sampling
[AD-A007387] N75-23836
TENNESSEE UNIV., KNOXVILLE.
Application of the radio frequency furnace technique to environmental trace analysis, part 1. The applicability of Hadamard Transform techniques to visible spectroscopy
N75-23722
An investigation of the theoretical limitations of a converter capacitor circuit during the charging and storage phases
N75-23845
Development of a nonpenetrating inductance probe for measuring lubricating film thickness in a dynamic seal
N75-23912
Laser beam deflection utilizing index of refraction gradients in liquid mediums
N75-23962
TENNESSEE UNIV. SPACE INST., TULLAHOMA.
On some problems encountered in a theoretical study of the external flow over a nozzle configuration in transonic flight
N75-23499
TEXAS A&M UNIV., COLLEGE STATION.
Improvement of propeller static thrust estimation
[NASA-CR-132680] N75-23567
Relationships between motion on isentropic surfaces from 3-H rawinsonde data and radar echoes
[NASA-CR-2558] N75-24232
Cloud motion in relation to the ambient wind field
[NASA-CR-2557] N75-24233
TEXAS HIGHWAY DEPT., AUSTIN.
Field evaluation of void spacing indicator
[PB-239044/1] N75-24019
TEXAS TECHNOLOGICAL UNIV., LUBBOCK.
Conversion of cattle feedlot wastes to ammonia synthesis gas
[PB-239668/7] N75-23692
TEXAS UNIV., AUSTIN.
Elevated temperature morphological stability of metal matrix fiber composites
[ORO-3947-11] N75-23712
Tables of scattering amplitudes, spin polarizations and phase shifts of 25 eV to 1500 eV electrons scattered elastically from Li, Na, Mg, P, K, Ca, Sc, Mn, Ga, Br, Sr, Mo, Rh, Cd, Ba, W, and Os, 3
[AD-A007055] N75-23739
Constraints on the conical expansions in hydrodynamical models
[ORO-3992-198] N75-23894
On-line management information system feasibility in an R and D environment
[AD-A007723] N75-24528
Copernicus observations of Betelgeuse and Antares
[NASA-CR-142815] N75-24598
TEXAS UNIV., EL PASO.
Pulse Doppler ambiguity resolution
[AD-A007416] N75-24415
TEXAS UNIV., HOUSTON.
Urban environmental health applications of remote sensing, summary report
[NASA-CR-141788] N75-24543
TEXAS UNIV. HEALTH SCIENCE CENTER, HOUSTON.
Urban environmental health applications of remote sensing
[NASA-CR-141796] N75-24522
TEXTRON, INC., SYLMAR, CALIF.
Terrestrial photovoltaic power systems with sunlight concentration
[PB-238506/0] N75-24136
THERMO ELECTRON CORP., WALTHAM, MASS.
Solar energy for process steam generation
[PB-238109/3] N75-24154
TRANSPORT AND ROAD RESEARCH LAB., CROWTHORNE [ENGLAND].
On an approximate yield criterion for thin steel shells
[PB-239166/2] N75-24040
TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
Lubricating oil burn-off in Coast Guard power plants
[AD-A007313] N75-23811
TRW SYSTEMS GROUP, REDONDO BEACH, CALIF.
Power processor for a 30cm ion thruster
[NASA-CR-134785] N75-23679
Ames Heat Pipe Experiment [AHPE] experiment description document
[NASA-CR-114413] N75-23880
Some self starting integrators for x Prime equals f [x, t]
[NASA-CR-141784] N75-24419
TRW, INC., LAWNDALE, CALIF.
Reliability study of microwave power transistors
[AD-A007788] N75-23863

U

ULTRASYSTEMS, INC., IRVINE, CALIF.
Nonequilibrium radiation model for exhaust plumes
[AD-A007795] N75-23687
UNITED AIR LINES, INC., DENVER, COLO.
Implications of equipping a DC-8-61 fleet with RNAV/two-segment approach avionics
[NASA-CR-137680] N75-23544
UNITED AIRCRAFT CORP., EAST HARTFORD, CONN.
Prediction of rotor wake induced flow along the rocket trajectories of an Army AH-1G helicopter
[AD-A007878] N75-23528
Nondestructive holographic techniques for structures inspection
[AD-A007850] N75-23946
UNITED AIRCRAFT CORP., STRATFORD, CONN.
Advanced overrunning clutch technology, design phase
[AD-A007815] N75-23562
UNIVERSITIES CENTER, JACKSON, MISS.
Artificial heart controls support
[ORO-4485-2] N75-24365
UNIVERSITY COLL., CARDIFF [WALES].
Star formation and contraction/fragmentation problems
N75-24583
UNIVERSITY COLL., LONDON [ENGLAND].
Recent observations of the 8-13 micron spectra of H2 regions
N75-24562
Far infrared photometry of H2 regions
N75-24565
Far infrared observations of W51 and the galactic centre
N75-24566
UPPER GREAT LAKES UNIV. CONSORTIUM FOR TRANSPORTATION.
Socio-psychological aspects of transportation, a background/resource paper for the Upper Great Lakes University Consortium for Transportation Research
[PB-238938/5] N75-24552
UTAH UNIV., SALT LAKE CITY.
Molecular mechanics of polymers by dynamic infrared techniques
N75-23786
Parameters of the pulsed phosphorus laser system
[AD-A007694] N75-23982
The charge ratio of ultra high energy cosmic ray muons
N75-24649

V

VEREINIGTE FLUGTECHNISCHE WERKE-FOKKER G.M.B.H., BREMEN [WEST GERMANY].
Airframe: Engine interaction for engine configurations mounted above the wing. Part 1: Interference between wing and intake jet
N75-23511
Airframe: Engine interaction for engine configurations mounted above the wing. Part 2: Engine jet simulation problems in wind tunnel tests
N75-23512
VERSAR, INC., SPRINGFIELD, VA.
Industrial energy study of the drug manufacturing industries for the Federal Energy Administration/US Department of Commerce
[PB-238994/8] N75-24130
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Manganese in Virginia soils and correction of manganese deficiency in soybeans [Glycine max L.]
N75-24071
Design optimization in underground coal systems
[PB-239075/5] N75-24153
Study of the reaction of atomic oxygen with aerosols
[NASA-CR-2529] N75-24441
VIRGINIA UNIV., CHARLOTTESVILLE.
Passenger demographics and subjective response to commuter aircraft in the northeast
[NASA-CR-142876] N75-23532
VOORHEES [ALAN M.] AND ASSOCIATES, INC., MCLEAN, VA.
Guidelines for air quality maintenance planning and analysis. Volume 4: Land use and transportation considerations
[PB-237583/0] N75-24171

W

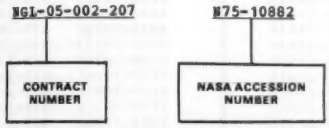
WASHINGTON UNIV., SEATTLE.
An experimental investigation of the boundary layer under pack ice
[AD-A007335] N75-24049
Laboratory investigation of internal wave generation models
[AD-A007351] N75-24284
The Intergovernmental Oceanographic Commission: An uncertain future
[COM-75-10233/5] N75-24287
Quantitation of microwave radiation effects on the eyes of rabbits at 2450 MHz and 918 MHz
[AD-A007521] N75-24344
Analysis of central nervous system involvement
[AD-A007581] N75-24345
Measurement of absorbed power patterns in the head and eyes of rabbits exposed with typical microwave sources
[AD-A007524] N75-24346
Electrophysiological effects of electromagnetic fields on animals
[AD-A007520] N75-24347
WASHINGTON UNIV., ST. LOUIS, MO.
Failure criteria to fracture mode analysis of composite laminates
N75-23700
Load and frequency control for interconnected power systems
[PB-239278/5] N75-23857
Astronomy at sub-millimeter wavelengths
[NASA-CR-142814] N75-23927
WESTINGHOUSE DEFENSE AND ELECTRONIC SYSTEMS CENTER, BALTIMORE, MD.
The 12 GHZ image and sum enhanced mixer diode converter
[NASA-CR-143792] N75-23848
WESTINGHOUSE ELECTRIC CORP., BALTIMORE, MD.
Analysis of RAE-B attitude data
[NASA-CR-143793] N75-23632

WESTINGHOUSE HANFORD CO., RICHLAND, WASH.
High temperature ultrasonic transducers for in-sodium service
[HEDL-SA-726] N75-23937
WESTLAND HELICOPTERS, LTD., YEOVIL [ENGLAND].
The background to current theories of scuffing
[S/T-MEMO-5/73] N75-23991
WICHITA STATE UNIV., KANS.
Effectiveness of spoilers on the GA[W]-1 airfoil with a high performance Fowler flap
[NASA-CR-2538] N75-23484
WIGGINS [J. H.] CO., REDONDO BEACH, CALIF.
Sound and vibration measurements for Concorde supersonic transport and subsonic jet aircraft
[PB-238748/8] N75-24436
WISCONSIN UNIV., MADISON.
Void nucleation and growth in heavy ion and electron bombarded pure metals
[COO-2206-5] N75-23763
Earth radiation budget measurement from a spinning satellite: Conceptual design of detectors
[NASA-CR-132494] N75-23920
Investigation of contact between ground surfaces through continuous time series model
N75-24027
Evaluation of the application of ERTS-1 data to the regional land use planning process
[E75-10280] N75-24053
Radiative transfer in spherical circumstellar dust envelopes
N75-24603
WOLF RESEARCH AND DEVELOPMENT CORP., RIVERDALE, MD.
The investigation of O and N2 densities from the OSO-7 extreme UV data
[NASA-CR-142759] N75-24644
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Energy exchange at the surface of the western North Atlantic Ocean
[AD-A007296] N75-24285
WORLD METEOROLOGICAL ORGANIZATION, GENEVA [SWITZERLAND].
World Weather Watch: Seventh status report on implementation
[WMO-401] N75-24234
WYOMING UNIV., LARAMIE.
The direct production of hydrocarbons from coal-steam systems
[PB-239356/9] N75-23740
Preliminary analysis of the Beaver Creek and Ninemile Hill areas, Wind River Basin, Wyoming using image ratios and thematic classification
[E75-10287] N75-24060

Y

YALE UNIV., NEW HAVEN, CONN.
The effects of topology on the properties of random network models for amorphous Group 4 semiconductors
N75-24495

Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number, the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

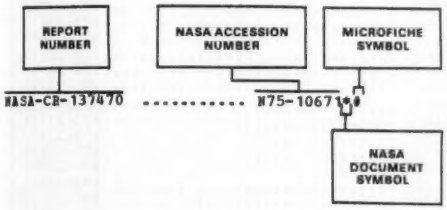
AF PROJ. 486U N75-23776
AF PROJ. 572D N75-24376
AF PROJ. 1138 N75-24358
AF PROJ. 1508A N75-23829
AF PROJ. 2153 N75-23947
AF PROJ. 3048 N75-23603 N75-23617
AF PROJ. 3145 N75-23605
AF PROJ. 3326 N75-23982 N75-24470
AF PROJ. 4600 N75-23840
AF PROJ. 5076 N75-23940
AF PROJ. 5519 N75-23863
AF PROJ. 5631 N75-23832
AF PROJ. 5635 N75-23831 N75-24518
AF PROJ. 6146 N75-23690
AF PROJ. 6244 N75-23954 N75-24367
AF PROJ. 7000 N75-24528
AF PROJ. 7116 N75-24459
AF PROJ. 7184 N75-24366
AF PROJ. 7231 N75-24350
AF PROJ. 7351 N75-23775 N75-23946
AF PROJ. 7360 N75-23733
AF PROJ. 7367 N75-23733 N75-23949
AF PROJ. 7371 N75-24520
AF PROJ. 7381 N75-24010
AF PROJ. 7930 N75-24349
AF PROJ. 8600 N75-24249
AF PROJ. 9751 N75-24487
AF PROJ. 9767 N75-23948
AF PROJ. 9990 N75-23616
DA PROJ. 1S7-62705-AH-94 N75-23860
AF-AFOSR-74-2687 N75-23700
AF-AFOSR-2332-72 N75-24487
AF-AFOSR-2566-73 N75-23948
AID-AFR/C-1058 N75-24087
AID/CSD-2584 N75-24089
AP-22-69-108 N75-24197
ARO PROJ. VF409 N75-23614
ARO PROJ. VF461 N75-23615
ARO PROJ. V32T-02A N75-23615
ARPA ORDER 189-1 N75-24251
ARPA ORDER 1615 N75-24048
ARPA ORDER 1807 N75-23980
ARPA ORDER 1849 N75-23791
ARPA ORDER 2158 N75-24471
ARPA ORDER 2494 N75-24398
ARPA ORDER 2609 N75-24247 N75-24248
ARPA ORDER 2669 N75-24468
AT(10-1)-1375 N75-23711 N75-23765
AT(11-1)-125 N75-24449
AT(11-1)-2206 N75-23763
AT(29-1)-789 N75-23892 N75-23970 N75-23996 N75-24372
AT(40-1)-3027 N75-24444
AT(40-1)-3665 N75-23764
AT(40-1)-3935 N75-23769
AT(40-1)-4485 N75-24365
AT(45-1)-1830 N75-23729 N75-24328 N75-24425 N75-24454
AT(45-1)-2170 N75-24038 N75-24533
CEG-403/058/22 N75-24009
DA PROJ. 1B2-62303-A-214 N75-23526
DA PROJ. 1P8-65801-HA-11 N75-23736
DGRST-72-7-0529 N75-23917
DA PROJ. 1T1-61102-B-52A N75-24085
DA PROJ. 1T6-62609-A-308 N75-23976
DA PROJ. 1T6-65702-D-127 N75-24254 N75-24255
DA PROJ. 1X3-64307-D-212 N75-23552
DA PROJ. 2N0-61102-B-71D N75-24348
DA PROJ. 3A0-61101-A-91C N75-24357
DA PROJ. 4A1-62121-A-894 N75-24050
DAAA21-74-C-0195 N75-23528
DAAB05-72-C-5869 N75-23944
DAAB07-72-C-0229 N75-23859
DAAB07-72-C-0259 N75-23731 N75-24516
DAAB07-73-C-0092 N75-23860
DAAD07-74-C-0094 N75-23981
DAAH01-73-C-1150 N75-24396
DAAH01-74-C-0 N75-23976
DAAH01-74-C-0183 N75-23499
DAAH03-74-C-0405 N75-23526
DAAJ02-74-C-0028 N75-23562
DAAK02-73-C-0221 N75-24018
DAHC04-70-C-0007 N75-23732
DAHC04-72-A-0001 N75-24415
DAHC04-73-C-0023 N75-23778
DAHC04-74-C-0001 N75-23608
DAHC04-74-C-0026 N75-23778
DAHC04-74-C-0034 N75-24399
DAHC04-74-G-0062 N75-23833
DAHC04-75-G-0031 N75-24210
DAHC15-73-C-0181 N75-24251
DAHC15-73-C-0435 N75-24398
DAJA37-73-C-4024 N75-24348
DARPA ORDER 2415 N75-24466
DGRST-69-01-723 N75-23475
DGRST-69-01-866 N75-23918
DGRST-69-01-893 N75-24206
DGRST-71-7-2624 N75-24052
DGRST-71-7-2861 N75-24501
DGRST-71-7-2863 N75-24531
DGRST-71-7-2885 N75-24028
DGRST-71-7-2903 N75-23749
DGRST-71-7-2958 N75-24465
DGRST-71-7-3113 N75-24030
DGRST-72-7-0141 N75-23695
DGRST-72-7-0536 N75-24500
DGRST-72-7-0538 N75-24499
DGRST-72-7-0540 N75-24013
DGRST-72-7-0609 N75-24464
DGRST-72-7-0693 N75-24029
DGRST-72-70-531 N75-23847
DGRST-73-7-1154 N75-24530
DI-BH-HO-133005 N75-23826
DI-14-01-0001-479 N75-23741
DI-14-01-0001-1196 N75-23740
DI-14-01-0001-1657 N75-24158
DI-14-01-0001-4041 N75-24080
DI-14-16-0008-802 N75-24054
DI-14-31-0001-3507 N75-24079
DI-14-31-0001-3541 N75-24093
DI-14-31-0001-3841 N75-24093
DI-14-31-0001-3872 N75-24261
DI-14-31-0001-4017 N75-24092
DI-14-31-0001-4022 N75-24184
DI-14-31-0001-4211 N75-24090
DI-14-31-0001-9045 N75-23897
DI-14-32-0001-1231 N75-24153
DI-14-32-0001-1234 N75-24127
DNA74-23494 N75-24503
DNA PROJ. NWED-QAXT N75-23867
DNA001-74-C-0014 N75-24216
DOT-FA7WA-3555 N75-23609
DOT-FA69WS-162 N75-24229
DOT-FA70WA-2448 N75-23531 N75-23548
DOT-FA72WA-728 N75-23547
DOT-FA72WAI-356 N75-23530 N75-23545
DOT-FA73WA-3203 N75-24354
DOT-FH-11-7136 N75-24078
DOT-FH-7664 N75-23774
DOT-HS-053-3-725 N75-23939
DOT-OS-30096 N75-24552
DOT-OS-30176 N75-24551
AF-AFOSR-72-2167 N75-23494
DOT-OS-40121 N75-24436
DOT-OS-40176 N75-23535 N75-23536 N75-23537 N75-23538
DSR PROJ. 71648 N75-23754
EPA-R-800316 N75-24194
EPA-R-801065 N75-23692
EPA-68-01-1132 N75-24135

EPA-68-01-1850 N75-24541
EPA-68-01-2116 N75-24195
EPA-68-01-2229 N75-24186 N75-24187
EPA-68-02-0218 N75-24199
EPA-68-02-0255 N75-24189
EPA-68-02-0575 N75-23956
EPA-68-02-0580 N75-24180
EPA-68-02-1005 N75-24173
EPA-68-02-1074 N75-24185
EPA-68-02-1094 N75-24175
EPA-68-02-1235 N75-23960
EPA-68-02-1325 N75-24179
EPA-68-02-1386 N75-24169 N75-24170
EPA-68-02-1388 N75-24171

ESTEC-1457/71 N75-23938
ESTEC-1679/72-PP N75-24001
ESTEC-1735/72-PP N75-23713
ESTEC-2019/73 N75-24016 N75-24017
EURATOM-052-65-2-BIAM N75-24314
EURATOM-107-72-1-BIAM N75-24340
FAA-ER-450-012A/B N75-23546
FCC-0072 N75-24553
F04611-73-C-0016 N75-23942
F04611-73-C-0032 N75-23687
F04701-72-C-0073 N75-24218
F04701-74-C-0075 N75-23715 N75-23735 N75-23945 N75-23977 N75-24467
F04701-74-C-0262 N75-23940
F19628-73-C-0001 N75-24387 N75-24388 N75-24389 N75-24390 N75-24391 N75-24392 N75-24393 N75-24394
F19628-73-C-0002 N75-23829
F19628-73-C-0023 N75-24518
F19628-73-C-0243 N75-24466
F19628-74-C-0148 N75-24468
F19628-75-C-0001 N75-24376
F29601-71-C-0023 N75-24470
F29601-73-C-0045 N75-23982
F30602-71-C-0371 N75-23955
F30602-72-C-0288 N75-23863
F30602-72-C-0392 N75-23954
F30602-73-C-0091 N75-23858
F30602-73-C-0132 N75-23952
F30602-73-C-0325 N75-23868
F30602-73-C-0377 N75-24367
F30602-74-C-0335 N75-24537
F33615-71-C-1668 N75-24010
F33615-71-C-1874 N75-23946
F33615-72-C-1480 N75-24366
F33615-72-C-1514 N75-23700
F33615-72-C-1740 N75-23776
F33615-72-C-2011 N75-24469
F33615-73-C-5129 N75-23949
F33615-73-C-5179 N75-24011
F33615-74-C-2035 N75-23617
F33615-74-C-5060 N75-23775
F41609-72-C-0037 N75-24358
F41609-73-C-0019 N75-24528
F44620-71-C-0091 N75-23739
F44620-72-C-0020 N75-23825
F44620-74-C-0035 N75-24247 N75-24248
HUD-CPA-NC-1034 N75-24073
ILIR PROJ. 4A-01 N75-24083
JPL-953830 N75-23676 N75-23677
MA-2-4178 N75-24289
MDA903-74-C-0167 N75-23782
NAONR-4-75 N75-23793 N75-23794
NASA ORDER C-43205-C N75-24504
NASA ORDER S-70256-AG N75-24059
NASA ORDER T-4105-B N75-24058
NASA ORDER T-4114-B N75-24054
NASA ORDER W-13183 N75-23625 N75-23936 N75-24640
NASA ORDER W-13450 N75-24296
NASW-2481 N75-23480 N75-23621 N75-23622 N75-23631 N75-23633 N75-23634 N75-23636 N75-23637 N75-23646 N75-23671 N75-23725 N75-23787 N75-23889 N75-23923 N75-23928 N75-23929 N75-24293 N75-24316 N75-24324 N75-24430 N75-24446
N75-24506 N75-24606 N75-24611 N75-24612 N75-24613 N75-24614 N75-24615 N75-24616 N75-24617 N75-24618 N75-24619 N75-24620 N75-24621 N75-24622 N75-24623 N75-24624 N75-24625 N75-24645
NASW-2483 N75-23533 N75-23696 N75-23724 N75-23757 N75-23850 N75-23926 N75-24230 N75-24262 N75-24295 N75-24318 N75-24320 N75-24321 N75-24322 N75-24323 N75-24326 N75-24361
NASW-2595 N75-24644
NASW-2727 N75-23620
NASW-2747 N75-24359
NASW-13450 N75-24294
NAS1-2973 N75-24209
NAS1-8141 N75-24209
NAS1-10646 N75-24441
NAS1-10749 N75-24032
NAS1-11654 N75-23667
NAS1-12324 N75-23930
NAS1-12436 N75-24382
NAS1-12764 N75-24037
NAS1-13204 N75-23920
NAS1-13233 N75-23568
NAS1-13496 N75-23558
NAS1-13620 N75-24113
NAS2-5503 N75-23880
NAS2-6563 N75-24605
NAS2-6973 N75-23482
NAS2-7358 N75-24626
NAS2-7475 N75-23544
NAS2-7684 N75-23611
NAS2-7698 N75-24057
NAS2-7790 N75-23932
NAS2-7842 N75-24569
NAS2-8135 N75-23534
NAS2-8268 N75-23483
NAS2-8503 N75-23543
NAS3-14383 N75-23679
NAS3-16759 N75-23755 N75-23756
NAS3-16804 N75-23683
NAS3-18026 N75-23572
NAS5-20018 N75-23652
NAS5-5603 N75-24605
NAS5-9099 N75-24593
NAS5-10625 N75-24209
NAS5-11054 N75-23922
NAS5-11411 N75-23985
NAS5-11499 N75-23986
NAS5-20083 N75-23632
NAS5-20968 N75-23882
NAS5-21444 N75-23853
NAS5-21754 N75-24053
NAS5-21799 N75-24060
NAS5-21808 N75-23630
NAS5-21845 N75-23848
NAS5-22312 N75-24066
NAS5-23340 N75-24569
NAS6-2006 N75-23919
NAS6-2602 N75-24210
NAS6-14000 N75-23627
NAS7-100 N75-23676 N75-23677 N75-24362
NAS8-20661 N75-23673
NAS8-21487 N75-23758
NAS8-21812 N75-24097
NAS8-24365 N75-23754
NAS8-24414 N75-23931
NAS8-26751 N75-24232 N75-24233
NAS8-26972 N75-23685
NAS8-27809 N75-23759
NAS8-28294 N75-24162
NAS8-28517 N75-23727
NAS8-28749 N75-23624
NAS8-29945 N75-23635
NAS8-30272 N75-24526
NAS8-30380 N75-24070
NAS8-30592 N75-23684
NAS8-30653 N75-24069
NAS8-30658 N75-23933 N75-23934 N75-23935
NAS8-33109 N75-23888
NAS9-9348 N75-24063
NAS9-12823 N75-24522 N75-24543
NAS9-12968 N75-23654
NAS9-13003 N75-23680
NAS9-13247 N75-23647 N75-23648 N75-23649 N75-23650 N75-23657 N75-23658 N75-23659 N75-23660 N75-23661 N75-23662 N75-23663 N75-23664 N75-23665 N75-23666
NAS9-13276 N75-24055
NAS9-13280 N75-24062
NAS9-13343 N75-24056
NAS9-13360 N75-24228
NAS9-13574 N75-24360
NAS9-13902 N75-23629
NAS9-13923 N75-23672
NAS9-14305 N75-24105
NAS9-14330 N75-24419
NAS9-14402 N75-23653
NAS9-14415 N75-23820
NAS9-14440 N75-24061
NAS10-8333 N75-24064 N75-24065
NBS PROJ. 3130453 N75-23793 N75-23794
NELC PROJ. F215 N75-24471
NGL-16-001-002 N75-24209
NGL-32-003-001 N75-24639
NGL-39-009-002 N75-24210
NGL-39-009-003 N75-24210
NGL-47-003-067 N75-24120 N75-24121 N75-24122
NGR-03-002-392 N75-24597
NGR-05-002-307 N75-24638
NGR-05-020-510 N75-24578
NGR-06-004-123 N75-24208
NGR-09-053-003 N75-23849
NGR-17-002-072 N75-23484
NGR-22-004-030 N75-23477 N75-23478 N75-23886 N75-23887

NGR-22-007-270 N75-24567
NGR-23-005-538 N75-23726
NGR-26-008-069 N75-23927
NGR-28-004-021 N75-24438
NGR-33-010-172 N75-24579
NGR-33-010-188 N75-24503
NGR-33-011-043 N75-24576 N75-24584
NGR-36-010-024 N75-23573
NGR-39-009-032 N75-24210
NGR-39-009-218 N75-24210
NGR-44-001-011 N75-23567
NGR-47-003-067 N75-24164
NGR-47-005-181 N75-23532
NOAA-04-3-022-12 N75-24282
NOAA-04-3-158-42 N75-24287
NOAA-04-4-158-41 N75-23841
NR PROJ. 031-762 N75-23780
NR PROJ. 039-087 N75-24515
NR PROJ. 047-064 N75-24399
NR PROJ. 049-345 N75-24410
NR PROJ. 056-377 N75-23689 N75-23796
NR PROJ. 064-471 N75-24045
NR PROJ. 083-004 N75-24285
NR PROJ. 083-012 N75-24284
NR PROJ. 083-275 N75-23951
NR PROJ. 084-129 N75-24397
NR PROJ. 093-050 N75-23779
NR PROJ. 133-076 N75-24191
NR PROJ. 196-120 N75-24368
NR PROJ. 201-054 N75-24345 N75-24347
NR PROJ. 201-055 N75-24344 N75-24346
NR PROJ. 260-112 N75-24041
NR PROJ. 307-326 N75-24049
NR PROJ. 307-354 N75-24049
NR PROJ. 388-102 N75-24084
NRL PROJ. A03-16 N75-24488
NRL PROJ. P01-04 N75-23714
NRL PROJ. P01-14 N75-23714
NRL PROJ. N01-33 N75-23975
NRL PROJ. R08-36 N75-23864
NSF AER-72-03579 N75-24132
NSF AG-344 N75-24048
NSF AG-492 N75-24048
NSF AG-502 N75-24145
NSF C-466 N75-23691
NSF C-656 N75-24403
NSF C-756 N75-24139
NSF C-867 N75-24128 N75-24155
NSF C-914 N75-24133
NSF DCR-72-03740-A1 N75-24412
NSF DCR-74-21822 N75-24374
NSF GA-30745 N75-24284
NSF GA-33446X2 N75-24210
NSF GI-14024 N75-24539
NSF GI-28098 N75-24223 N75-24224 N75-24225
NSF GI-29729 N75-24138 N75-24151 N75-24152
NSF GI-32488 N75-24157
NSF GI-34932 N75-24149
NSF GI-34969 N75-23857
NSF GI-34979 N75-24134 N75-24147
NSF GI-36598 N75-24144
NSF GI-36731 N75-24137
NSF GI-38445 N75-24146
NSF GI-39150 N75-24140
NSF GI-39278 N75-24547
NSF GI-39539 N75-24159
NSF GI-41894 N75-24136
NSF GI-43795 N75-24150
NSF GJ-33097 N75-24378
NSF GJ-35568 N75-24426
NSF GJ-36265 N75-24412
NSF GJ-40221 N75-24401
NSF GJ-41538 N75-23855 N75-24386
NSF GK-1889 N75-23895 N75-23909
NSF GK-37442 N75-24238
NSF GK-40032 N75-23718
NSF GK-40130 N75-23958 N75-23959
NSF GP-36426X N75-24577
NSF GR-41854 N75-24210
NSF 29342 N75-24082
NSG-5005 N75-24598
NSG-7054 N75-24599 N75-24600 N75-24601
NSG-8007 N75-24445
NSG-8011 N75-24439
N01-HB-3-2913 N75-23797
N01-LM-1-4718 N75-24343
N00014-67-A-0103-0014 N75-24284
N00014-67-A-0103-0021 N75-24049
N00014-67-A-0103-0025 N75-24344 N75-24346
N00014-67-A-0103-0026 N75-24345 N75-24347
N00014-67-A-0103-0034 N75-24049
N00014-67-A-0112-0011 N75-24399
N00014-67-A-0112-0081 N75-24045
N00014-67-A-0151-0011 N75-23689 N75-23796
N00014-67-A-0159-0005 N75-23779
N00014-67-A-0204-0041 N75-24515
N00014-67-A-0305-0024 N75-23837
N00014-67-A-0377-0010 N75-23978
N00014-67-A-0385-0014 N75-24210
N00014-68-A-0152 N75-24041
N00014-68-A-0196-0009 N75-24209
N00014-68-A-0215-0013 N75-24191
N00014-69-A-0200-1062 N75-23780
N00014-69-A-0200-4027 N75-24397
N00014-69-A-0200-4035 N75-24084
N00014-69-C-0182 N75-23896
N00014-72-C-0264 N75-24368
N00014-72-C-0430 N75-23980
N00014-73-C-0121 N75-23862
N00014-74-C-0079 N75-23861
N00014-74-C-0184 N75-24536
N00014-74-C-0262 N75-24285
N00014-74-C-0362 N75-23866
N00014-74-C-0394 N75-23979
N00014-75-C-0266 N75-24410
N00019-72-C-0221 N75-23710
N00019-73-C-0139 N75-23792
N00019-73-C-0405 N75-23710
N00019-74-C-0222 N75-23836
N00019-74-C-0259 N75-23953
N00123-72-C-2293 N75-23800
N00140-74-C-0618 N75-23604
N60921-74-C-0203 N75-23905
N61331-74-C-0032 N75-24435
N62269-73-C-0743 N75-23717
N62269-73-C-0800 N75-23716
N62269-74-C-0149 N75-23566
ORA PROJ. 010808 N75-23726
PASA-TA(IC)-02-72 N75-24088
PHS-GM-17940 N75-23859
PROJ. R3651 N75-23834
RR0330242 N75-24488
RR1310301 N75-23951
R0284401 N75-23835
SP43422 N75-24043
SP53554706 N75-24188
SRI PROJ. 1556 N75-23825
SRI PROJ. 2763 N75-24553
SR00901 N75-23896
W-31-109-ENG-38 N75-24509 N75-24510
W-7405-ENG-26 N75-23973 N75-24373 N75-24532
W-7405-ENG-36 N75-23788 N75-23893 N75-23968 N75-23971 N75-23972
W-7405-ENG-48 N75-23766 N75-23767 N75-23768
N75-23789 N75-24443 N75-24451 N75-24480
W-7405-ENG-82 N75-23746
WRK-210 N75-24207
XP54545007 N75-23864
160-44-64-05-00 N75-24441
176-53-32-01 N75-24068
185-47-68-01 N75-23515
320-039-23-01-01 N75-23852
501-03-11 N75-23549 N75-23606
501-06-08-03 N75-23470
501-22-11-01-00 N75-24037
504-09-21-01 N75-23556
505-01 N75-23761
505-03 N75-23760
505-04 N75-23602 N75-23990
505-06-22 N75-23481
505-08-31-01 N75-23555
505-10-11-03 N75-23484
505-11-21-02 N75-23514 N75-23559
506-26-10-06 N75-23651
514-52-01 N75-23479
514-54 N75-23557

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche. A plus sign (+) indicates a document that cannot be microfiched but for which one-to-one facsimile is available.

A-4825 ..... N75-23515*#
A-5530 ..... N75-23549*#
A-5710 ..... N75-23606*#
A-5918 ..... N75-23481*#
A-5998 ..... N75-23557*#
A-6064 ..... N75-23479*#

AD-A001031 ..... N75-24235 #
AD-A001457 ..... N75-24236 #
AD-A001912 ..... N75-24244 #
AD-A001918 ..... N75-24245 #
AD-A001973 ..... N75-24246 #
AD-A002973 ..... N75-24395 #
AD-A002975 ..... N75-24375 #
AD-A002997 ..... N75-24434 #
AD-A003088 ..... N75-23856 #
AD-A003416 ..... N75-23776 #
AD-A003417 ..... N75-23775 #
AD-A006574 ..... N75-24216 #
AD-A006580 ..... N75-24018 #
AD-A006672 ..... N75-23896 #
AD-A006758 ..... N75-23782 #
AD-A006801 ..... N75-24514*#
AD-A006804 ..... N75-24129 #
AD-A006826 ..... N75-24188 #
AD-A006923 ..... N75-24242 #
AD-A006990 ..... N75-24237 #
AD-A007034 ..... N75-24247 #
AD-A007035 ..... N75-24248 #
AD-A007041 ..... N75-23553 #
AD-A007055 ..... N75-23739 #
AD-A007067 ..... N75-23825 #
AD-A007070 ..... N75-23940 #
AD-A007104 ..... N75-24342 #
AD-A007111 ..... N75-23839 #
AD-A007148 ..... N75-24399 #
AD-A007258 ..... N75-23944 #
AD-A007259 ..... N75-24487 #
AD-A007260 ..... N75-23833 #
AD-A007261 ..... N75-23608 #
AD-A007262 ..... N75-23732 #
AD-A007263 ..... N75-23976 #
AD-A007270 ..... N75-23791 #
AD-A007272 ..... N75-23859 #
AD-A007273 ..... N75-23778 #
AD-A007277 ..... N75-23860 #
AD-A007282 ..... N75-24348 #
AD-A007284 ..... N75-23951 #
AD-A007285 ..... N75-24084 #
AD-A007290 ..... N75-23899 #
AD-A007292 ..... N75-23975 #
AD-A007293 ..... N75-23714 #
AD-A007294 ..... N75-23864 #
AD-A007296 ..... N75-24285 #
AD-A007297 ..... N75-23812 #
AD-A007302 ..... N75-23519 #
AD-A007303 ..... N75-23898 #

AD-A007307 ..... N75-23560 #
AD-A007308 ..... N75-23525 #
AD-A007312 ..... N75-23906 #
AD-A007313 ..... N75-23811 #
AD-A007316 ..... N75-23524 #
AD-A007317 ..... N75-23521 #
AD-A007329 ..... N75-24041 #
AD-A007334 ..... N75-23800 #
AD-A007335 ..... N75-24049 #
AD-A007338 ..... N75-23837 #
AD-A007339 ..... N75-23792 #
AD-A007347 ..... N75-23689 #
AD-A007348 ..... N75-23796 #
AD-A007350 ..... N75-23981 #
AD-A007351 ..... N75-24284 #
AD-A007352 ..... N75-23716 #
AD-A007353 ..... N75-23779 #
AD-A007354 ..... N75-23866 #
AD-A007358 ..... N75-24534 #
AD-A007359 ..... N75-23953 #
AD-A007360 ..... N75-23780 #
AD-A007384 ..... N75-24368 #
AD-A007386 ..... N75-23717 #
AD-A007387 ..... N75-23836 #
AD-A007391 ..... N75-23561 #
AD-A007397 ..... N75-23518 #
AD-A007399 ..... N75-23613 #
AD-A007400 ..... N75-23640 #
AD-A007402 ..... N75-23903 #
AD-A007406 ..... N75-23900 #
AD-A007407 ..... N75-23901 #
AD-A007408 ..... N75-24653 #
AD-A007410 ..... N75-23902 #
AD-A007414 ..... N75-23904 #
AD-A007415 ..... N75-24141 #
AD-A007416 ..... N75-24415 #
AD-A007417 ..... N75-24410 #
AD-A007429 ..... N75-23540 #
AD-A007430 ..... N75-23527 #
AD-A007431 ..... N75-24516 #
AD-A007433 ..... N75-23905 #
AD-A007434 ..... N75-23731 #
AD-A007438 ..... N75-23830 #
AD-A007445 ..... N75-23794 #
AD-A007447 ..... N75-23793 #
AD-A007448 ..... N75-24253 #
AD-A007455 ..... N75-24046 #
AD-A007456 ..... N75-23641 #
AD-A007458 ..... N75-23907 #
AD-A007462 ..... N75-24254 #
AD-A007468 ..... N75-24255 #
AD-A007470 ..... N75-23539 #
AD-A007471 ..... N75-23517 #
AD-A007476 ..... N75-24042 #
AD-A007477 ..... N75-23686 #
AD-A007481 ..... N75-24043 #
AD-A007482 ..... N75-23834 #
AD-A007483 ..... N75-23838 #
AD-A007484 ..... N75-24286 #
AD-A007486 ..... N75-23835 #
AD-A007487 ..... N75-24488 #
AD-A007512 ..... N75-24471 #
AD-A007513 ..... N75-23777 #
AD-A007515 ..... N75-24356 #
AD-A007516 ..... N75-23522 #
AD-A007520 ..... N75-24347 #
AD-A007521 ..... N75-24344 #
AD-A007524 ..... N75-24346 #
AD-A007550 ..... N75-24416 #
AD-A007551 ..... N75-23541 #
AD-A007552 ..... N75-24397 #
AD-A007553 ..... N75-23523 #
AD-A007557 ..... N75-23801 #
AD-A007561 ..... N75-24045 #
AD-A007563 ..... N75-24398 #
AD-A007566 ..... N75-23802 #
AD-A007574 ..... N75-23604 #
AD-A007577 ..... N75-23980 #
AD-A007579 ..... N75-24251 #
AD-A007580 ..... N75-24515 #

AD-A007581 ..... N75-24345 #
AD-A007583 ..... N75-24143 #
AD-A007585 ..... N75-24536 #
AD-A007587 ..... N75-23862 #
AD-A007588 ..... N75-24191 #
AD-A007612 ..... N75-24535 #
AD-A007618 ..... N75-23861 #
AD-A007620 ..... N75-23979 #
AD-A007623 ..... N75-23550 #
AD-A007624 ..... N75-24408 #
AD-A007649 ..... N75-23529 #
AD-A007651 ..... N75-23828 #
AD-A007654 ..... N75-24217 #
AD-A007656 ..... N75-24468 #
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AD-A007659 ..... N75-23605 #
AD-A007661 ..... N75-23520 #
AD-A007662 ..... N75-23603 #
AD-A007663 ..... N75-23563 #
AD-A007664 ..... N75-24423 #
AD-A007665 ..... N75-23831 #
AD-A007670 ..... N75-23867 #
AD-A007671 ..... N75-23642 #
AD-A007672 ..... N75-24044 #
AD-A007675 ..... N75-23840 #
AD-A007678 ..... N75-24256 #
AD-A007679 ..... N75-24249 #
AD-A007680 ..... N75-24083 #
AD-A007682 ..... N75-23565 #
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AD-A007685 ..... N75-23947 #
AD-A007686 ..... N75-23832 #
AD-A007687 ..... N75-24192 #
AD-A007688 ..... N75-23614 #
AD-A007689 ..... N75-23615 #
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AD-A007692 ..... N75-24470 #
AD-A007694 ..... N75-23982 #
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AD-A007697 ..... N75-24229 #
AD-A007699 ..... N75-23566 #
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AD-A007728 ..... N75-23803 #
AD-A007732 ..... N75-24085 #
AD-A007733 ..... N75-24048 #
AD-A007734 ..... N75-24082 #
AD-A007735 ..... N75-24050 #
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AD-A007767 ..... N75-24388 #
AD-A007768 ..... N75-24389 #
AD-A007769 ..... N75-24390 #
AD-A007770 ..... N75-24391 #
AD-A007771 ..... N75-24392 #
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AD-A007773 ..... N75-24394 #
AD-A007774 ..... N75-23954 #
AD-A007775 ..... N75-23955 #
AD-A007776 ..... N75-24537 #
AD-A007778 ..... N75-24467 #
AD-A007779 ..... N75-23715 #
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AD-A007785 ..... N75-23868 #
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AD-A007791 ..... N75-24466 #
AD-A007792 ..... N75-24218 #
AD-A007793 ..... N75-23526 #
AD-A007794 ..... N75-23942 #
AD-A007795 ..... N75-23687 #
AD-A007799 ..... N75-24142 #
AD-A007812 ..... N75-24357 #
AD-A007815 ..... N75-23562 #
AD-A007823 ..... N75-23829 #
AD-A007827 ..... N75-24376 #
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AD-A007836 ..... N75-23643 #
AD-A007838 ..... N75-24469 #
AD-A007840 ..... N75-23616 #
AD-A007841 ..... N75-24459 #

AD-A007842 ..... N75-24350 #
AD-A007846 ..... N75-24252 #
AD-A007847 ..... N75-24435 #
AD-A007848 ..... N75-24520 #
AD-A007849 ..... N75-23733 #
AD-A007850 ..... N75-23946 #
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AD-A007853 ..... N75-23617 #
AD-A007854 ..... N75-23865 #
AD-A007862 ..... N75-24519 #
AD-A007863 ..... N75-24517 #
AD-A007864 ..... N75-23795 #
AD-A007867 ..... N75-23551 #
AD-A007871 ..... N75-23734 #
AD-A007872 ..... N75-23950 #
AD-A007873 ..... N75-24010 #
AD-A007874 ..... N75-24366 #
AD-A007877 ..... N75-23943 #
AD-A007878 ..... N75-23528 #
AD-A008898 ..... N75-23546 #
AD-A008926 ..... N75-23547 #
AD-A008931 ..... N75-23530 #
AD-A008933 ..... N75-23609 #
AD-A008934 ..... N75-23545 #
AD-A008940 ..... N75-23531 #
AD-A009296 ..... N75-24354 #
AD-A009299 ..... N75-23548 #
AD-A606792 ..... N75-24317 #

AD-782158 ..... N75-24396 #

ADL-C-74830 ..... N75-23683*#

AE-499 ..... N75-23762 #

AEC-IS-T-652 ..... N75-23746

AEDC-TR-74-117 ..... N75-24192 #
AEDC-TR-74-126 ..... N75-23614 #
AEDC-TR-75-1 ..... N75-23615 #

AERONOMICA-ACTA-A-139-1974 ..... N75-24205

AFAPL-TR-74-42 ..... N75-23563 #
AFAPL-TR-74-74 ..... N75-23603 #
AFAPL-TR-74-101 ..... N75-23617 #
AFAPL-TR-74-118 ..... N75-23605 #

AFATL-TR-74-169 ..... N75-23642 #

AFCRL-AFSG-294 ..... N75-24249 #

AFCRL-ERP-492 ..... N75-23832 #
AFCRL-ERP-496 ..... N75-24083 #

AFCRL-PSRP-613 ..... N75-23867 #
AFCRL-PSRP-617 ..... N75-23831 #
AFCRL-PSRP-618 ..... N75-23947 #
AFCRL-PSRP-623 ..... N75-23840 #

AFCRL-TR-74-0469 ..... N75-24249 #
AFCRL-TR-74-0518 ..... N75-24468 #
AFCRL-TR-74-0539 ..... N75-23832 #
AFCRL-TR-74-0559 ..... N75-24518 #
AFCRL-TR-74-0582 ..... N75-23867 #
AFCRL-TR-74-0616 ..... N75-23831 #
AFCRL-TR-74-0617 ..... N75-23947 #
AFCRL-TR-74-0625 ..... N75-24083 #
AFCRL-TR-75-0014 ..... N75-23840 #
AFCRL-TR-75-0041 ..... N75-24466 #

AFFDL-TR-74-47-VOL-2 ..... N75-23776 #
AFFDL-TR-75-19 ..... N75-23690 #

AFFTC-TD-75-2 ..... N75-23616 #

AFHRL-TR-74-79 ..... N75-24358 #
AFHRL-TR-74-98 ..... N75-24528 #

AFL-74-12-15 ..... N75-23905 #

AFLRL-52 ..... N75-24018 #

AFML-TR-73-247-VOL-2 ..... N75-23775 #
AFML-TR-73-318 ..... N75-24520 #
AFML-TR-74-26 ..... N75-24010 #
AFML-TR-74-121 ..... N75-23733 #
AFML-TR-74-130 ..... N75-23946 #

AFHL-TR-74-208-PT-1 ..... N75-24011 #
AFHL-TR-74-240 ..... N75-24469 #
AFHL-TR-74-268 ..... N75-23949 #

AFOSR-75-0390TR ..... N75-23739 #
AFOSR-75-0396TR ..... N75-23825 #
AFOSR-75-0397TR-VOL-1 ..... N75-24247 #
AFOSR-75-0398TR-VOL-2 ..... N75-24248 #
AFOSR-75-0406TR ..... N75-24487 #

AFRPL-TR-74-74 ..... N75-23687 #
AFRPL-TR-75-9 ..... N75-23942 #

AFWL-TR-74-63 ..... N75-23982 #
AFWL-TR-74-117 ..... N75-24470 #

AGARD-CP-150 ..... N75-23485 #
AGARD-CP-151 ..... N75-23575 #
AGARD-CP-153 ..... N75-24297 #
AGARD-CP-163 ..... N75-23698 #

AMA-74-32 ..... N75-23635*#

AMHRC-MS-75-1 ..... N75-23791 #

AMHRC-PTR-75-1 ..... N75-23736 #

AMRL-TR-73-10 ..... N75-24366 #
AMRL-TR-74-101 ..... N75-24350 #

AMSR.0039.74 ..... N75-24039 #

ANCR-1189 ..... N75-23711 #

ANSI-N543-1974-REV ..... N75-24353 #

AQD/U-000667 ..... N75-23773 #

AR-1 ..... N75-24195 #
AR-2 ..... N75-24191 #
AR-8 ..... N75-24283 #

ARC-CP-1311 ..... N75-23574 #

ARC-34645 ..... N75-23574 #

ARL-74-0176 ..... N75-24459 #

ARO-ETF-TR-74-92 ..... N75-24192 #

ARO-WKP-TR-74-103 ..... N75-23615 #

ARO-8444-3-P ..... N75-23732 #
ARO-9372-6-E ..... N75-23608 #
ARO-11266-4-MC ..... N75-23778 #
ARO-12147-2-RTL ..... N75-23833 #
ARO-12215-5-M ..... N75-24399 #

ASD-TR-74-39 ..... N75-23565 #

ASPC-1987-26F ..... N75-23800 #

ATR-75(7361)-1 ..... N75-23620*#

AWS-TR-74-250 ..... N75-24256 #

BBC-RD-1975/13 ..... N75-23819
BBC-RD-1975/14 ..... N75-23818

BBN-3022 ..... N75-23932*#

BECHTEL-10900-74-43-I ..... N75-24128 #
BECHTEL-10900-74-43-I-APP ..... N75-24155 #

BK005-1009 ..... N75-23882*#

BM-IC-8650 ..... N75-24131 #

BM-RI-7965 ..... N75-24074 #

BMD/A-16-74-R1 ..... N75-24396 #

BMFT-FB-T-7407 ..... N75-23850*#

BMVG-FBWT-74-8 ..... N75-23804 #

BNL-19271 ..... N75-24511 #
BNL-19276 ..... N75-24512 #
BNL-19278 ..... N75-24652 #

BNL-19300 ..... N75-24442 #
BNL-19348 ..... N75-23790 #
BNL-19365 ..... N75-24409 #

BNWL-SA-5216 ..... N75-24425 #

BNWL-1845-1 ..... N75-23729 #
BNWL-1845-3 ..... N75-24454 #
BNWL-1850-PT-4 ..... N75-24328 #

BRL-MR-2442 ..... N75-23803 #

BR33386 ..... N75-23991 #
BR42666 ..... N75-23773 #
BR47149 ..... N75-24033 #
BR47431 ..... N75-24384 #

BSR-4175-VOL-1-ADD ..... N75-23933*#
BSR-4175-VOL-2-BK-1-ADD ..... N75-23934*#
BSR-4175-VOL-2-BK-2-ADD ..... N75-23935*#

C-43205-C/FR/75 ..... N75-24504*#
CALSPAN-ZQ-5351-V-2 ..... N75-23939 #

CASD-NAS-75-021 ..... N75-23685*#

CCC-CED-75-DTEP-005 ..... N75-23839 #

CGR/DC-40/74 ..... N75-23943 #

CL-1974-4 ..... N75-24167 #
CL-1974-5 ..... N75-24168 #
CL-1974-12 ..... N75-24310 #

CMS-75-017 ..... N75-24540 #

COM-74-11717/7 ..... N75-23826 #
COM-74-50190/364-1 ..... N75-24647 #
COM-74-50190/364-2 ..... N75-24648 #
COM-74-50276/37 ..... N75-24221 #
COM-74-51149/4 ..... N75-24524 #
COM-75-10139/4 ..... N75-23869 #
COM-75-10140/2 ..... N75-24289 #
COM-75-10147/7 ..... N75-23957 #
COM-75-10161/8 ..... N75-23842 #
COM-75-10181/6 ..... N75-24288 #
COM-75-10192/3 ..... N75-24282 #
COM-75-10193/1 ..... N75-24240 #
COM-75-10194/9 ..... N75-24239 #
COM-75-10197/2 ..... N75-24181 #
COM-75-10199/8 ..... N75-23827 #
COM-75-10200/4 ..... N75-24407 #
COM-75-10201/2 ..... N75-24081 #
COM-75-10209 ..... N75-23742 #
COM-75-10217/8 ..... N75-24222 #
COM-75-10233/5 ..... N75-24287 #
COM-75-10248/3 ..... N75-24257 #
COM-75-10250/9 ..... N75-24290 #
COM-75-10256/6 ..... N75-24260 #
COM-75-10260/8 ..... N75-24258 #
COM-75-10266/5 ..... N75-23841 #
COM-75-10267/3 ..... N75-24259 #
COM-75-10269/9 ..... N75-24292 #
COM-75-10275/6 ..... N75-24291 #
COM-75-50005/8 ..... N75-24243 #
COM-75-50070/2 ..... N75-23941 #
COM-75-50071/0 ..... N75-24183 #
COM-75-50072-017 ..... N75-24540 #
COM-75-50114/8 ..... N75-24241 #
COM-75-50159/3 ..... N75-24406 #
COM-75-50164/3 ..... N75-24283 #
COM-75-50166/8 ..... N75-24353 #

CONF-740314-5 ..... N75-23728 #
CONF-740522 ..... N75-24448 #
CONF-740576-1 ..... N75-24369 #
CONF-740837-4 ..... N75-24451 #
CONF-740840-2 ..... N75-23768 #
CONF-740851-1 ..... N75-24652 #
CONF-740851-2 ..... N75-24442 #
CONF-740957-21 ..... N75-24509 #
CONF-740957-22 ..... N75-24512 #
CONF-740957-23 ..... N75-24511 #
CONF-741048 ..... N75-23969 #
CONF-741057-3 ..... N75-24510 #
CONF-741086-9 ..... N75-24453 #
CONF-741105-50 ..... N75-23972 #
CONF-741116-2 ..... N75-24513 #
CONF-741123-2 ..... N75-23937 #
CONF-741136-1 ..... N75-23788 #

CONF-741138 ..... N75-24372 #
CONF-741140-1 ..... N75-24409 #
CONF-741144-1 ..... N75-24126 #
CONF-741202-13 ..... N75-24450 #
CONF-741216-1 ..... N75-24546*#
CONF-741223-1 ..... N75-23809 #
CONF-750102-2 ..... N75-23790 #
CONF-750109-6 ..... N75-24452 #
CONF-750202-1 ..... N75-24425 #
CONF-750202-2 ..... N75-24047 #
CONF-750206-2 ..... N75-24385 #
CONF-750207-1 ..... N75-24420 #

CONTRIB-2626 ..... N75-24638*#

COO-125-57 ..... N75-24449 #
COO-2206-5 ..... N75-23763 #

CRANFIELD-AERO-29 ..... N75-23607 #

CRC-R-1260 ..... N75-23821 #

CRC-TN-671(CS-03-01) ..... N75-23655 #

CRC-1268 ..... N75-24034 #

CRIF-MT-102 ..... N75-24422 #

CRREL-RR-329 ..... N75-24048 #
CRREL-RR-331 ..... N75-24082 #
CRREL-RR-332 ..... N75-24085 #

CRREL-SR-219 ..... N75-24050 #

CSG-MEMO-111 ..... N75-24374 #

CU-CS-056-74 ..... N75-24377 #
CU-CS-057-74 ..... N75-24402 #

DCIEM-74-R-1048 ..... N75-23564 #
DCIEM-74-R-1067 ..... N75-24363 #

DLR-FB-74-57 ..... N75-23638 #

DLR-2 ..... N75-23820*#

DNDC-14091 ..... N75-23781 #

DNS-AR-1023 ..... N75-23526 #

DNS-DR-2084-VOL-3 ..... N75-23657*#
DNS-DR-2084-VOL-4 ..... N75-23658*#
DNS-DR-2084-VOL-5 ..... N75-23659*#
DNS-DR-2084-VOL-6 ..... N75-23660*#
DNS-DR-2084-VOL-7 ..... N75-23661*#
DNS-DR-2084-VOL-8 ..... N75-23662*#
DNS-DR-2084-VOL-9 ..... N75-23663*#
DNS-DR-2084-VOL-10 ..... N75-23664*#
DNS-DR-2084-VOL-11 ..... N75-23665*#
DNS-DR-2129-VOL-1 ..... N75-23647*#
DNS-DR-2129-VOL-2 ..... N75-23648*#
DNS-DR-2131 ..... N75-23650*#
DNS-DR-2204 ..... N75-23666*#

DOC-75SD4215 ..... N75-23630*#

DOD/CCG-69-13 ..... N75-23957 #

DOT-HS-801-263 ..... N75-23939 #

DOT-TST-75-12 ..... N75-23618 #
DOT-TST-75-21 ..... N75-24436 #

DOT-40176-1 ..... N75-23538 #
DOT-40176-2 ..... N75-23537 #
DOT-40176-3 ..... N75-23536 #
DOT-40176-4 ..... N75-23535 #

DOT/TST-75-35 ..... N75-24552 #

DR-875 ..... N75-24254 #
DR-877-PT-3 ..... N75-24255 #

DREV-TN-2099/74 ..... N75-23965 #

DTCE/3096 ..... N75-24499

E-7492 ..... N75-23988*#
E-7971 ..... N75-23990*#
E-8146 ..... N75-23602*#
E-8181 ..... N75-23752*#
E-8185 ..... N75-23760*#
E-8248 ..... N75-23761*#
E-8271 ..... N75-24478*#
E-8307 ..... N75-24505*#
E-8308 ..... N75-23688*#
E-8320 ..... N75-24111*#
E-8321 ..... N75-23851*#
E-8322 ..... N75-23569*#
E-8326 ..... N75-23697*#
E-8327 ..... N75-24110*#
E-8328 ..... N75-23884*#
E-8329 ..... N75-24319*#
E-8333 ..... N75-23668*#
E-8335 ..... N75-24106*#
E-8336 ..... N75-24119*#
E-8338 ..... N75-24108*#
E-8344 ..... N75-24112*#
E-8347 ..... N75-23883*#
E-8351 ..... N75-24117*#
E-8353 ..... N75-23681*#
E-8355 ..... N75-23989*#
E-8356 ..... N75-23753*#
E-8360 ..... N75-24440*#
E-8362 ..... N75-24118*#
E-8364 ..... N75-23891*#
E-8365 ..... N75-24116*#

ECOM-73-0092-F ..... N75-23860 #
ECOM-75-1 ..... N75-23981 #

EERL-73-23 ..... N75-24223 #
EERL-74-55 ..... N75-24224 #
EERL-74-56-VOL-2 ..... N75-24225 #

EO-SP-74026 ..... N75-24142 #

EOARD-TR-75-14 ..... N75-23948 #

EPA-RNEF-75/1 ..... N75-23693 #

EPA-SW-530-88C ..... N75-24135 #

EPA-450/3-73-006-A-VOL-1 ..... N75-24189 #
EPA-450/4-74-002 ..... N75-24169 #
EPA-450/4-74-003 ..... N75-24170 #
EPA-450/4-74-004 ..... N75-24171 #
EPA-450/4-74-007-VOL-6 ..... N75-24172 #
EPA-450/4-74-008-VOL-7 ..... N75-24173 #
EPA-450/4-74-009-VOL-8 ..... N75-24174 #
EPA-450/4-74-011-VOL-10 ..... N75-24175 #
EPA-450/4-74-012-VOL-11 ..... N75-24176 #
EPA-450/4-74-013-VOL-12 ..... N75-24177 #
EPA-550/9-74-004 ..... N75-24351 #
EPA-550/9-74-019A-VOL-1 ..... N75-24186 #
EPA-550/9-74-019B-VOL-2 ..... N75-24187 #
EPA-560/4-74-001 ..... N75-24196 #
EPA-600/4-74-004 ..... N75-24178 #
EPA-600/5-74-033 ..... N75-24541 #
EPA-650/2-74-078-A ..... N75-24185 #
EPA-650/2-74-094 ..... N75-23956 #
EPA-650/2-74-105 ..... N75-24199 #
EPA-650/2-74-110 ..... N75-24194 #
EPA-650/2-74-118 ..... N75-24179 #
EPA-650/4-74-040 ..... N75-24180 #
EPA-650/4-74-050 ..... N75-23960 #
EPA-650/4-75-002 ..... N75-24197 #
EPA-660/2-74-090 ..... N75-23692 #
EPA-660/3-74-024 ..... N75-24200 #

EPRI-SR-4 ..... N75-24148 #

ERC-R-74017 ..... N75-24136 #

ERIM-101900-52-L ..... N75-24062*#
ERIM-104000-1-F ..... N75-24064*#
ERIM-104000-1-F ..... N75-24065*#
ERIM-196200-12-F ..... N75-24078 #

ER75-4176 ..... N75-23672*#

ESD-TR-74-372 ..... N75-24376 #
ESD-TR-75-137 ..... N75-23829 #

ESN-29-3 ..... N75-24535 #

ESRO-CR(P)-597 ..... N75-23713 #
ESRO-CR(P)-610 ..... N75-24016 #

ESRO-CR(P)-611 ..... N75-24017 #

ESRO-CR-212 ..... N75-23938 #

ESRO-SP-105 ..... N75-24555 #

ESRO-SR-22-ESTEC ..... N75-23670 #
ESRO-SR-24-ESOC ..... N75-23639 #

ESRO-TT-138 ..... N75-23638 #

E75-10280 ..... N75-24053*#
E75-10281 ..... N75-24054*#
E75-10282 ..... N75-24055*#
E75-10283 ..... N75-24056*#
E75-10284 ..... N75-24057*#
E75-10285 ..... N75-24058*#
E75-10286 ..... N75-24059*#
E75-10287 ..... N75-24060*#
E75-10288 ..... N75-24061*#
E75-10289 ..... N75-24062*#

FAA-AM-75-2 ..... N75-24317 #

FAA-ED-12-2A ..... N75-23550 #

FAA-EM-75-1 ..... N75-24408 #
FAA-EM-75-3 ..... N75-23548 #
FAA-EM-75-5 ..... N75-23531 #

FAA-NA-75-150 ..... N75-23547 #

FAA-RD-75-5 ..... N75-24229 #
FAA-RD-75-10 ..... N75-24354 #
FAA-RD-75-17 ..... N75-23546 #
FAA-RD-75-29 ..... N75-23547 #
FAA-RD-75-45 ..... N75-23609 #
FAA-RD-75-47 ..... N75-23530 #
FAA-RD-75-49 ..... N75-23545 #

FCC-OCE-75-RS-03 ..... N75-24553 #

FEA/EI-1657 ..... N75-24158 #
FEA/EI-1669 ..... N75-24130 #

FHWA-RD-74-28 ..... N75-24078 #
FHWA-RD-74-59 ..... N75-23774 #

FOA-C10017-H7 ..... N75-24411 #

FSTC-HT-23-949-74 ..... N75-24517 #
FSTC-HT-23-0005-75 ..... N75-24519 #
FSTC-HT-23-0372-74 ..... N75-23865 #

FTD-HC-23-0721-75 ..... N75-23561 #
FTD-HC-23-0843-75 ..... N75-23900 #
FTD-HC-23-0867-75 ..... N75-23539 #
FTD-HC-23-0969-75 ..... N75-23795 #
FTD-HC-23-1855-74 ..... N75-23783 #
FTD-HC-23-2625-74 ..... N75-24653 #

FTD-HT-23-0850-75 ..... N75-23613 #

FTD-HT-24-267-75 ..... N75-23524 #
FTD-HT-24-304-75 ..... N75-23904 #
FTD-HT-24-344-75 ..... N75-23899 #
FTD-HT-24-436-75 ..... N75-23517 #
FTD-HT-24-478-75 ..... N75-24423 #
FTD-HT-24-0343-75 ..... N75-23519 #
FTD-HT-24-0345-75 ..... N75-23640 #
FTD-HT-24-0369-75 ..... N75-23908 #
FTD-HT-24-0379-75 ..... N75-23898 #
FTD-HT-24-0395-75 ..... N75-23901 #
FTD-HT-24-0427-75 ..... N75-23560 #
FTD-HT-24-0521-75 ..... N75-24044 #
FTD-HT-24-0524-75 ..... N75-23902 #
FTD-HT-24-0525-75 ..... N75-23903 #
FTD-HT-24-0530-75 ..... N75-23907 #
FTD-HT-24-0544-75 ..... N75-23525 #
FTD-HT-24-0553-75 ..... N75-23521 #
FTD-HT-24-0557-75 ..... N75-23518 #
FTD-HT-24-0560-75 ..... N75-23641 #
FTD-HT-24-0564-75 ..... N75-23520 #
FTD-HT-24-0573-75 ..... N75-24046 #
FTD-HT-24-0574-75 ..... N75-24042 #
FTD-HT-24-0582-75 ..... N75-23906 #
FTD-HT-24-1544-74 ..... N75-23856 #

FTD-HT24-0530-75 ..... N75-23907 #

G-7448 ..... N75-23852*#
G-7523 ..... N75-24231*#

GASL-789 ..... N75-24354 #

GCE/HC/74-1-VOL-2 ..... N75-24129 #

GE/EE/74-54 ..... N75-24514*#

GEOMET-EF-326-VOL-10 ..... N75-24175 #

GIT-A-1621 ..... N75-24069*#

GPO-22-562 ..... N75-24125 #
GPO-28-965 ..... N75-24114 #
GPO-34-980 ..... N75-24124 #
GPO-38-010 ..... N75-24123 #
GPO-40-684 ..... N75-24104 #
GPO-48-071 ..... N75-24115 #
GPO-51-423 ..... N75-24542 #

GRU.13.GAHF.75 ..... N75-23604 #

GSA/OP/MCL-TM-231-REV-1 ..... N75-24666 #
GSA/OP/MCL-TM-234-REV-1 ..... N75-24667 #
GSA/OP/MCL-TM-235-REV-1 ..... N75-24668 #

HAC-P74-457 ..... N75-23566 #

HAC-REF-D0824 ..... N75-23652*#

HEDL-SA-726 ..... N75-23937 #

HEDL-TME-74-51 ..... N75-24038 #
HEDL-TME-74-60 ..... N75-24533 #

HSD-TP-7509-VOL-1-SUMM ..... N75-23713 #

HSPC-75.T05 ..... N75-24360*#

IBM-69-K44-0006H ..... N75-23627*#

ICP-1036 ..... N75-23765 #

IFA-SR-9-1974 ..... N75-23770 #

IFSM-74-66 ..... N75-23717 #

INDEX-67.80-JD ..... N75-24503*#

IPP-4/120 ..... N75-24479*#

IR-HC-42 ..... N75-24088 #

IR-2 ..... N75-23552 #
IR-7 ..... N75-24554 #
IR-109-75 ..... N75-23629*#

IRI-133-74-06 ..... N75-24455 #

ISBN-0-7065-1493-9 ..... N75-24219 #
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ISBN-92-63-10401-8 ..... N75-24234 #

ISL-12/74 ..... N75-24009 #

ISN-74-12 ..... N75-24447 #

ISSUE-1 ..... N75-24627*#
ISSUE-1 ..... N75-24631*#
ISSUE-2 ..... N75-24628*#
ISSUE-2 ..... N75-24632*#
ISSUE-3 ..... N75-24629*#
ISSUE-3 ..... N75-24633*#
ISSUE-4 ..... N75-24630*#
ISSUE-4 ..... N75-24634*#
ISSUE-5 ..... N75-24635*#
ISSUE-6 ..... N75-24636*#
ISSUE-7 ..... N75-24637*#

ISU-CCL-7401 ..... N75-24378 #

JACKFAU-101-74 ..... N75-24541 #

JINR-P4-8032 ..... N75-24432 #

JPL-900-710 ..... N75-24362*#

JPRS-64751 ..... N75-24655 #
JPRS-64770 ..... N75-24662 #

L-9757 ..... N75-23470*#
L-9987 ..... N75-23514*#
L-10073 ..... N75-23651*#
L-10076 ..... N75-23556*#

LA-UR-74-1716 ..... N75-23788 #
LA-UR-74-1883 ..... N75-23972 #

LA-5619-MS-REV ..... N75-23968 #
LA-5680 ..... N75-23893 #
LA-5839-MS ..... N75-23971 #

LBL-2775 ..... N75-23768 #
LBL-3151 ..... N75-23767 #
LBL-3174 ..... N75-23766 #
LBL-3319 ..... N75-24369 #
LBL-3363 ..... N75-24451 #
LBL-3384 ..... N75-23789 #

LC-4-18089 ..... N75-24524 #

LEA-74-8 ..... N75-23609 #

LMSC-D26656 ..... N75-23896 #

LMSC-HREC-TR-D390429 ..... N75-23976 #

LR-27113 ..... N75-23568*#

LRP-88/74 ..... N75-24481 #

M-TU-75-3 ..... N75-24107*#
M-TU-75-5 ..... N75-24544*#

M-133 ..... N75-24035*#
M-143 ..... N75-24232*#

MARINE-TR-35 ..... N75-24290 #

MASGP-74-043 ..... N75-24081 #

MB/DL-CRL-32/43 ..... N75-24500
MB/MC-GD-2036/73 ..... N75-23917

MBL-1974-25 ..... N75-24332 #
MBL-1974-26 ..... N75-24333 #
MBL-1974-28 ..... N75-24329 #
MBL-1974-29 ..... N75-24334 #
MBL-1974-30 ..... N75-24335 #
MBL-1974-31 ..... N75-24336 #
MBL-1974-32 ..... N75-24337 #
MBL-1974-33 ..... N75-24338 #
MBL-1974-34 ..... N75-24339 #
MBL-1974-35 ..... N75-24340 #
MBL-1974-36 ..... N75-24341 #
MBL-1974-38 ..... N75-24314 #
MBL-1975-1 ..... N75-24330 #
MBL-1975-2 ..... N75-24331 #
MBL-1975-4 ..... N75-24311 #
MBL-1975-5 ..... N75-24312 #
MBL-1975-6 ..... N75-24313 #

MCR-75-21 ..... N75-23684*#
MCR-75-151-1 ..... N75-23888*#

MDB/MD-3055 ..... N75-23847

MDC-E1148 ..... N75-24368 #

MDC-G5241 ..... N75-23667*#
MDC-G5456 ..... N75-24526*#

MDC-J4484-VOL-1 ..... N75-23534*#

MITSG-75-4 ..... N75-24292 #

MPI-PAE/EXTRATERR-106 ..... N75-24476
MPI-PAE/EXTRATERR-108 ..... N75-24207

MPIS-MITT-59 ..... N75-23516 #

MPR-17 ..... N75-24058*#
MPR-23 ..... N75-24057*#

MR-403219 ..... N75-23532*#

MRPR-4 ..... N75-24342 #

MSC-14802 ..... N75-24419*#

MSNW-75-105-4 ..... N75-23980 #

MTC-TM-10-15-74 ..... N75-24551 #

MTR-2648-VOL-1 ..... N75-24387 #
MTR-2648-VOL-2 ..... N75-24388 #
MTR-2648-VOL-4 ..... N75-24390 #
MTR-2648-VOL-5 ..... N75-24391 #
MTR-2648-VOL-6 ..... N75-24392 #
MTR-2648-VOL-7 ..... N75-24393 #
MTR-2677-VOL-1 ..... N75-24376 #
MTR-6753 ..... N75-24539 #
MTR-6789 ..... N75-24408 #
MTR-6831 ..... N75-24229 #
MTR-6880 ..... N75-23548 #

MTR2648-VOL-8 ..... N75-24394 #

M73-237-REV-1 ..... N75-23531 #
M138 ..... N75-24502*#

NADC-74018-40 ..... N75-23541 #
NADC-74112-30 ..... N75-24356 #
NADC-74234-30 ..... N75-23522 #

NAS/RANN/SE/AER-72-03597/A03 ..... N75-24132 #

NASA-CASE-MSC-12631-1 ..... N75-23476*#

NASA-CASE-MPO-13327-1 ..... N75-23910*

NASA-CR-2357 ..... N75-23683*#
NASA-CR-2529 ..... N75-24441*#
NASA-CR-2535 ..... N75-24037*#
NASA-CR-2538 ..... N75-23484*#
NASA-CR-2557 ..... N75-24233*#
NASA-CR-2558 ..... N75-24232*#
NASA-CR-114413 ..... N75-23880*#
NASA-CR-120618 ..... N75-23627*#
NASA-CR-120725 ..... N75-24526*#
NASA-CR-120749 ..... N75-24097*#
NASA-CR-120750 ..... N75-23624*#
NASA-CR-120751 ..... N75-23727*#
NASA-CR-120752 ..... N75-23758*#
NASA-CR-120753 ..... N75-23931*#
NASA-CR-120754 ..... N75-23933*#
NASA-CR-120755 ..... N75-23934*#
NASA-CR-120756 ..... N75-23935*#
NASA-CR-120757 ..... N75-23754*#
NASA-CR-120760 ..... N75-23673*#
NASA-CR-120762 ..... N75-24070*#
NASA-CR-120763 ..... N75-24069*#
NASA-CR-120764 ..... N75-23759*#
NASA-CR-120765 ..... N75-23888*#
NASA-CR-120767 ..... N75-23635*#
NASA-CR-120768 ..... N75-23684*#
NASA-CR-120769 ..... N75-23685*#
NASA-CR-129003 ..... N75-24162*#
NASA-CR-132494 ..... N75-23920*#
NASA-CR-132615 ..... N75-23667*#
NASA-CR-132633 ..... N75-23558*#
NASA-CR-132644 ..... N75-24382*#
NASA-CR-132646 ..... N75-24032*#
NASA-CR-132649 ..... N75-23568*#
NASA-CR-132672 ..... N75-23930*#
NASA-CR-132680 ..... N75-23567*#
NASA-CR-134445 ..... N75-23657*#
NASA-CR-134446 ..... N75-23658*#
NASA-CR-134447 ..... N75-23659*#
NASA-CR-134448 ..... N75-23660*#
NASA-CR-134449 ..... N75-23661*#
NASA-CR-134450 ..... N75-23662*#
NASA-CR-134785 ..... N75-23679*#
NASA-CR-134791 ..... N75-23755*#
NASA-CR-134792 ..... N75-23756*#
NASA-CR-134795 ..... N75-23572*#
NASA-CR-134836 ..... N75-24508*#
NASA-CR-136741-VOL-1 ..... N75-23676*#
NASA-CR-136741-VOL-2 ..... N75-23677*#
NASA-CR-137603 ..... N75-23534*#
NASA-CR-137646 ..... N75-23483*#
NASA-CR-137652 ..... N75-23932*#
NASA-CR-137668 ..... N75-23543*#
NASA-CR-137669 ..... N75-23482*#

NASA-CR-137680 ..... N75-23544*#
NASA-CR-137684 ..... N75-23611*#
NASA-CR-139385-1 ..... N75-24064*#
NASA-CR-139385-2 ..... N75-24065*#
NASA-CR-141394 ..... N75-23919*#
NASA-CR-141501 ..... N75-23663*#
NASA-CR-141502 ..... N75-23664*#
NASA-CR-141503 ..... N75-23665*#
NASA-CR-141522 ..... N75-23647*#
NASA-CR-141523 ..... N75-23648*#
NASA-CR-141525 ..... N75-23666*#
NASA-CR-141529 ..... N75-23649*#
NASA-CR-141530 ..... N75-23650*#
NASA-CR-141765 ..... N75-23654*#
NASA-CR-141784 ..... N75-24419*#
NASA-CR-141787 ..... N75-23672*#
NASA-CR-141788 ..... N75-24543*#
NASA-CR-141789 ..... N75-23629*#
NASA-CR-141790 ..... N75-23820*#
NASA-CR-141791 ..... N75-24105*#
NASA-CR-141792 ..... N75-23653*#
NASA-CR-141793 ..... N75-24360*#
NASA-CR-141794 ..... N75-24228*#
NASA-CR-141795 ..... N75-23680*#
NASA-CR-141796 ..... N75-24522*#
NASA-CR-142708 ..... N75-24053*#
NASA-CR-142709 ..... N75-24059*#
NASA-CR-142710 ..... N75-24060*#
NASA-CR-142718 ..... N75-24054*#
NASA-CR-142719 ..... N75-24055*#
NASA-CR-142720 ..... N75-24056*#
NASA-CR-142721 ..... N75-24057*#
NASA-CR-142722 ..... N75-24058*#
NASA-CR-142723 ..... N75-24061*#
NASA-CR-142724 ..... N75-24062*#
NASA-CR-142728 ..... N75-24107*#
NASA-CR-142748 ..... N75-24438*#
NASA-CR-142757 ..... N75-24294*#
NASA-CR-142758 ..... N75-23620*#
NASA-CR-142759 ..... N75-24644*#
NASA-CR-142761 ..... N75-24605*#
NASA-CR-142762 ..... N75-24445*#
NASA-CR-142799 ..... N75-24099*#
NASA-CR-142800 ..... N75-24208*#
NASA-CR-142801 ..... N75-24503*#
NASA-CR-142803 ..... N75-23849*#
NASA-CR-142809 ..... N75-24597*#
NASA-CR-142811 ..... N75-23477*#
NASA-CR-142812 ..... N75-24209*#
NASA-CR-142813 ..... N75-24626*#
NASA-CR-142814 ..... N75-23927*#
NASA-CR-142815 ..... N75-24598*#
NASA-CR-142816 ..... N75-24113*#
NASA-CR-142817 ..... N75-23886*#
NASA-CR-142818 ..... N75-23478*#
NASA-CR-142819 ..... N75-23887*#
NASA-CR-142820 ..... N75-24120*#
NASA-CR-142821 ..... N75-24122*#
NASA-CR-142822 ..... N75-24164*#
NASA-CR-142823 ..... N75-24121*#
NASA-CR-142824 ..... N75-24359*#
NASA-CR-142825 ..... N75-24296*#
NASA-CR-142826 ..... N75-24628*#
NASA-CR-142827 ..... N75-24627*#
NASA-CR-142828 ..... N75-24629*#
NASA-CR-142829 ..... N75-24630*#
NASA-CR-142830 ..... N75-24210*#
NASA-CR-142869 ..... N75-23726*#
NASA-CR-142875 ..... N75-24439*#
NASA-CR-142876 ..... N75-23532*#
NASA-CR-142877 ..... N75-24638*#
NASA-CR-142878 ..... N75-24362*#
NASA-CR-142879 ..... N75-24599*#
NASA-CR-142880 ..... N75-24600*#
NASA-CR-142881 ..... N75-24601*#
NASA-CR-142894 ..... N75-24639*#
NASA-CR-142900 ..... N75-24063*+
NASA-CR-143696 ..... N75-24593*#
NASA-CR-143744 ..... N75-23630*#
NASA-CR-143746 ..... N75-23652*#
NASA-CR-143792 ..... N75-23848*#
NASA-CR-143793 ..... N75-23632*#
NASA-CR-143794 ..... N75-23985*#
NASA-CR-143795 ..... N75-24066*#
NASA-CR-143796 ..... N75-23986*#
NASA-CR-143797 ..... N75-23882*#
NASA-CR-143799 ..... N75-23922*#

NASA-NEWS-RELEASE-75-95 ..... N75-23619*#
NASA-NEWS-RELEASE-75-118 ..... N75-23623*#

NASA-SP-6508 ..... N75-23853*#
NASA-SP-7011(139) ..... N75-24315*+
NASA-SP-7043(03) ..... N75-24094*+
NASA-SP-8117 ..... N75-24608*#
NASA-SP-8118 ..... N75-24607*#

NASA-TM-X-3212 ..... N75-23651*#
NASA-TM-X-3215 ..... N75-23602*#
NASA-TM-X-62414 ..... N75-23481*#
NASA-TM-X-62423 ..... N75-23557*#
NASA-TM-X-62431 ..... N75-23479*#
NASA-TM-X-64926 ..... N75-23925*#
NASA-TM-X-64927 ..... N75-24383*#
NASA-TM-X-64929 ..... N75-23682*#
NASA-TM-X-66808 ..... N75-23678*#
NASA-TM-X-66813 ..... N75-24546*#
NASA-TM-X-66814 ..... N75-23644*#
NASA-TM-X-66815 ..... N75-23645*#
NASA-TM-X-66817 ..... N75-24641*#
NASA-TM-X-66818 ..... N75-24544*#
NASA-TM-X-66827 ..... N75-24631*#
NASA-TM-X-66828 ..... N75-24632*#
NASA-TM-X-66829 ..... N75-24633*#
NASA-TM-X-66830 ..... N75-24634*#
NASA-TM-X-66831 ..... N75-24635*#
NASA-TM-X-66832 ..... N75-24636*#
NASA-TM-X-66833 ..... N75-24637*#
NASA-TM-X-70888 ..... N75-24067*#
NASA-TM-X-70890 ..... N75-24646*#
NASA-TM-X-70891 ..... N75-24595*#
NASA-TM-X-70892 ..... N75-24594*#
NASA-TM-X-70893 ..... N75-24596*#
NASA-TM-X-70894 ..... N75-23924*#
NASA-TM-X-70896 ..... N75-24072*#
NASA-TM-X-70897 ..... N75-23656*#
NASA-TM-X-70899 ..... N75-24642*#
NASA-TM-X-70900 ..... N75-24643*#
NASA-TM-X-71641 ..... N75-23752*#
NASA-TM-X-71677 ..... N75-24478*#
NASA-TM-X-71700 ..... N75-23688*+
NASA-TM-X-71705 ..... N75-23570*#
NASA-TM-X-71707 ..... N75-24111*#
NASA-TM-X-71708 ..... N75-23569*#
NASA-TM-X-71710 ..... N75-23697*#
NASA-TM-X-71711 ..... N75-24319*#
NASA-TM-X-71713 ..... N75-23668*#
NASA-TM-X-71714 ..... N75-24106*#
NASA-TM-X-71715 ..... N75-24119*#
NASA-TM-X-71716 ..... N75-23884*#
NASA-TM-X-71718 ..... N75-24108*#
NASA-TM-X-71719 ..... N75-24116*#
NASA-TM-X-71720 ..... N75-24110*#
NASA-TM-X-71721 ..... N75-24505*#
NASA-TM-X-71722 ..... N75-24109*#
NASA-TM-X-71723 ..... N75-24112*#
NASA-TM-X-71724 ..... N75-24014*#
NASA-TM-X-71725 ..... N75-23883*#
NASA-TM-X-71726 ..... N75-23573*#
NASA-TM-X-71727 ..... N75-23669*#
NASA-TM-X-71728 ..... N75-24117*#
NASA-TM-X-71729 ..... N75-23681*#
NASA-TM-X-71730 ..... N75-23989*#
NASA-TM-X-71731 ..... N75-23753*#
NASA-TM-X-71732 ..... N75-24440*#
NASA-TM-X-71733 ..... N75-23988*#
NASA-TM-X-71735 ..... N75-23851*#
NASA-TM-X-71736 ..... N75-23891*#
NASA-TM-X-71738 ..... N75-24118*#
NASA-TM-X-71742 ..... N75-24507*#
NASA-TM-X-71942 ..... N75-24477*#
NASA-TM-X-72574 ..... N75-24211*#
NASA-TM-X-72575 ..... N75-24212*#
NASA-TM-X-72654 ..... N75-23890*#
NASA-TM-X-72655 ..... N75-23556*#
NASA-TM-X-72665 ..... N75-23987*#
NASA-TM-X-72677 ..... N75-23881*#
NASA-TM-X-72678 ..... N75-23571*#
NASA-TM-X-72681 ..... N75-23559*#
NASA-TM-X-72682 ..... N75-23885*#
NASA-TM-X-72686 ..... N75-23610*#
NASA-TM-X-72689 ..... N75-24068*#
NASA-TM-X-72692 ..... N75-23921*#
NASA-TM-X-72695 ..... N75-23555*#
NASA-TM-X-72727 ..... N75-24163*#

NASA-TN-D-7829 ..... N75-23549*#
NASA-TN-D-7887 ..... N75-23470*#

NASA-TN-D-7910 ..... N75-23514*#
NASA-TN-D-7940 ..... N75-23606*#
NASA-TN-D-7948 ..... N75-23852*#
NASA-TN-D-7966 ..... N75-23760*#
NASA-TN-D-7967 ..... N75-23990*#
NASA-TN-D-7974 ..... N75-23515*#
NASA-TN-D-7989 ..... N75-23761*#
NASA-TN-D-7994 ..... N75-24231*#

NASA-TR-R-439 ..... N75-24035*#
NASA-TR-R-443 ..... N75-24502*#

NASA-TT-F-16196 ..... N75-24324*#
NASA-TT-F-16220 ..... N75-23637*#
NASA-TT-F-16225 ..... N75-24262*#
NASA-TT-F-16252 ..... N75-23625*#
NASA-TT-F-16253 ..... N75-24640*#
NASA-TT-F-16257 ..... N75-24326*#
NASA-TT-F-16263 ..... N75-23633*#
NASA-TT-F-16267 ..... N75-24321*#
NASA-TT-F-16275 ..... N75-23696*#
NASA-TT-F-16276 ..... N75-24446*#
NASA-TT-F-16278 ..... N75-24654*#
NASA-TT-F-16288 ..... N75-23724*#
NASA-TT-F-16291 ..... N75-24479*#
NASA-TT-F-16298 ..... N75-23636*#
NASA-TT-F-16305 ..... N75-23926*#
NASA-TT-F-16312 ..... N75-24322*#
NASA-TT-F-16314 ..... N75-24318*#
NASA-TT-F-16315 ..... N75-24323*#
NASA-TT-F-16316 ..... N75-23634*#
NASA-TT-F-16332 ..... N75-24430*#
NASA-TT-F-16333 ..... N75-24615*#
NASA-TT-F-16334 ..... N75-23631*#
NASA-TT-F-16335 ..... N75-24616*#
NASA-TT-F-16336 ..... N75-24617*#
NASA-TT-F-16337 ..... N75-24613*#
NASA-TT-F-16338 ..... N75-24618*#
NASA-TT-F-16339 ..... N75-24612*#
NASA-TT-F-16340 ..... N75-24625*#
NASA-TT-F-16341 ..... N75-24624*#
NASA-TT-F-16342 ..... N75-24623*#
NASA-TT-F-16343 ..... N75-24622*#
NASA-TT-F-16344 ..... N75-24621*#
NASA-TT-F-16345 ..... N75-24620*#
NASA-TT-F-16346 ..... N75-23671*#
NASA-TT-F-16347 ..... N75-23923*#
NASA-TT-F-16348 ..... N75-24619*#
NASA-TT-F-16350 ..... N75-24614*#
NASA-TT-F-16351 ..... N75-24611*#
NASA-TT-F-16352 ..... N75-24606*#
NASA-TT-F-16353 ..... N75-24645*#
NASA-TT-F-16354 ..... N75-24295*#
NASA-TT-F-16355 ..... N75-23936*#
NASA-TT-F-16356 ..... N75-24293*#
NASA-TT-F-16357 ..... N75-24316*#
NASA-TT-F-16359 ..... N75-23480*#
NASA-TT-F-16364 ..... N75-23725*#
NASA-TT-F-16365 ..... N75-23850*#
NASA-TT-F-16369 ..... N75-23646*#
NASA-TT-F-16371 ..... N75-23622*#
NASA-TT-F-16381 ..... N75-23757*#
NASA-TT-F-16383 ..... N75-24506*#
NASA-TT-F-16384 ..... N75-24320*#
NASA-TT-F-16385 ..... N75-24361*#
NASA-TT-F-16386 ..... N75-23621*#
NASA-TT-F-16387 ..... N75-23787*#
NASA-TT-F-16388 ..... N75-24230*#
NASA-TT-F-16393 ..... N75-23928*#
NASA-TT-F-16394 ..... N75-23929*#
NASA-TT-F-16396 ..... N75-23533*#
NASA-TT-F-16400 ..... N75-23889*#
NASA-TT-F-16431 ..... N75-24327*#

NBS-H-114-REV ..... N75-24353 #

NBS-MN-148 ..... N75-23941 #

NBS-SP-409 ..... N75-24183 #

NBSIR-74-389 ..... N75-23826 #
NBSIR-74-395 ..... N75-23842 #
NBSIR-74-482 ..... N75-23957 #
NBSIR-74-596 ..... N75-23742 #
NBSIR-75-658 ..... N75-23794 #
NBSIR-75-664 ..... N75-23793 #

NEAR-TR-83 ..... N75-23483*#
NEAR-TR-84 ..... N75-23482*#

NELC-TR-1942 ..... N75-24471 #
NELC-TR-1946 ..... N75-23777 #

NGTE-321 ..... N75-23574 #

NIH/DF-74/004A ..... N75-24400 #

NISC-TRANS-3619 ..... N75-23830 #
NISC-TRANS-3622 ..... N75-24141 #
NISC-TRANS-3631 ..... N75-23527 #
NISC-TRANS-3634 ..... N75-23828 #
NISC-TRANS-3643 ..... N75-23529 #

NLR-TR-74116-C-PT-1 ..... N75-24016 #
NLR-TR-74116-C-PT-2 ..... N75-24017 #

NMAB-5-C ..... N75-24534 #
NMAB-310 ..... N75-23782 #

NMRC-KP-116A ..... N75-23869 #
NMRC-KP-123A ..... N75-24289 #

NOAA-TM-ERL-AOML-23 ..... N75-24407 #

NOAA-TM-ERL-ARL-46 ..... N75-24181 #

NOAA-TM-ERL-NSSL-72 ..... N75-24240 #
NOAA-TM-ERL-NSSL-74 ..... N75-24257 #

NOAA-TM-ERL-SEL-36 ..... N75-23827 #
NOAA-TM-ERL-SEL-37-PT-2 ..... N75-24222 #

NOAA-TM-NWS-NHC-55 ..... N75-24259 #

NOAA-TR-ERL-306-AL-9 ..... N75-24241 #
NOAA-TR-ERL-309 ..... N75-24406 #

NOAA-TR-NESS-65 ..... N75-24260 #

NOAA-TR-NOS-64 ..... N75-24291 #

NOAA-73102413 ..... N75-24260 #
NOAA-74020401 ..... N75-24258 #
NOAA-74111806 ..... N75-24243 #
NOAA-74122606 ..... N75-24241 #
NOAA-74122701 ..... N75-24290 #
NOAA-75010801 ..... N75-24221 #
NOAA-75011402 ..... N75-24257 #
NOAA-75011501 ..... N75-24647 #
NOAA-75011502 ..... N75-24648 #
NOAA-75012105 ..... N75-24287 #
NOAA-75012108 ..... N75-24239 #
NOAA-75012109 ..... N75-24081 #
NOAA-75012201 ..... N75-24240 #
NOAA-75012402 ..... N75-24406 #
NOAA-75012403 ..... N75-24407 #
NOAA-75012404 ..... N75-24181 #
NOAA-75012405 ..... N75-23827 #
NOAA-75012406 ..... N75-24222 #
NOAA-75012407 ..... N75-24283 #
NOAA-75012702 ..... N75-24282 #
NOAA-75021107 ..... N75-24259 #
NOAA-75021201 ..... N75-23841 #
NOAA-75021305 ..... N75-24292 #
NOAA-75021306 ..... N75-24291 #

NOLTR-74-164 ..... N75-24188 #

NPL-NAC-56 ..... N75-24421 #

NPS-57HE75021 ..... N75-24416 #
NPS-58BB75021 ..... N75-23951 #
NPS-59NM75021 ..... N75-23523 #

NRL-MR-2741 ..... N75-23734 #
NRL-MR-2748 ..... N75-23950 #
NRL-MR-2999 ..... N75-23975 #
NRL-MR-3002 ..... N75-24488 #

NRL-7772-PT-1 ..... N75-24434 #
NRL-7839 ..... N75-23714 #
NRL-7855 ..... N75-23864 #
NRL-7856 ..... N75-23835 #

NSF-OCA-GJ35568X-350 ..... N75-24426 #

NSF-72-22 ..... N75-24523 #
NSF-73-20 ..... N75-24538 #

NSF/OCA-DCR-74-21822 ..... N75-24374 #
NSF/RA/N-73-082 ..... N75-24138 #
NSF/RA/N-73-090 ..... N75-24151 #
NSF/RA/N-74-063 ..... N75-24145 #
NSF/RA/N-74-085 ..... N75-24147 #
NSF/RA/N-74-102 ..... N75-24149 #
NSF/RA/N-74-110 ..... N75-24134 #
NSF/RA/N-74-124 ..... N75-24150 #
NSF/RA/N-74-125 ..... N75-24157 #
NSF/RA/N-74-128 ..... N75-24137 #
NSF/RA/N-74-129 ..... N75-24136 #
NSF/RA/N-74-131 ..... N75-24146 #
NSF/RA/N-74-134 ..... N75-24159 #
NSF/RA/N-74-138 ..... N75-24132 #
NSF/RA/N-74-141 ..... N75-24156 #
NSF/RA/N-74-150 ..... N75-23857 #
NSF/RA/N-74-163 ..... N75-24144 #
NSF/RA/N-74-165 ..... N75-24140 #
NSF/RA/N-74-171 ..... N75-24139 #
NSF/RA/N-74-189 ..... N75-24539 #
NSF/RA/S-74-009 ..... N75-24547 #
NSF/RANN/SE/AER7417631/PR/74/3 ..... N75-24156 #
NSF/RANN/SE/GI-29729/TR-73-4 ..... N75-24138 #
NSF/RANN/SE/GI-29729/TR/73/1 ..... N75-24152 #
NSF/RANN/SE/GI-29729/TR/73/2 ..... N75-24151 #
NSF/RANN/SE/GI-32488/TR/73 ..... N75-24157 #
NSF/RANN/SE/GI-34979/TR-74/1 ..... N75-24147 #
NSF/RANN/SE/GI-34979/TR-74/4 ..... N75-24134 #
NSF/RANN/SE/GI-36731/PR/74/3 ..... N75-24137 #
NSF/RANN/SE/GI-38445X/PR-74-3 ..... N75-24146 #
NSF/RANN/SE/GI-39539/PR-74-3 ..... N75-24159 #
NSF/RANN/SE/GI-41894/PR-74-3 ..... N75-24136 #

NSWRL-793 ..... N75-24342 #

NSRDC-4335 ..... N75-23686 #
NSRDC-4577 ..... N75-24043 #

NSSDC-75-02 ..... N75-24211*#
NSSDC-75-03 ..... N75-24212*#

NUC-TP-278-REV-1 ..... N75-23812 #
NUC-TP-440 ..... N75-23838 #
NUC-TP-441 ..... N75-23834 #

NUCE-ST-74-15 ..... N75-24238 #

NWC-TP-5684 ..... N75-23800 #

OAQPS-1.2-021-VOL-2 ..... N75-24169 #
OAQPS-1.2-022-VOL-3 ..... N75-24170 #
OAQPS-1.2-023-VOL-4 ..... N75-24171 #
OAQPS-1.2-025-VOL-6 ..... N75-24172 #
OAQPS-1.2-026-VOL-7 ..... N75-24173 #
OAQPS-1.2-027 ..... N75-24174 #
OAQPS-1.2-029-VOL-10 ..... N75-24175 #
OAQPS-1.2-030-VOL-11 ..... N75-24176 #
OAQPS-1.2-031-VOL-12 ..... N75-24177 #

OCD-PS-66-100 ..... N75-24143 #

OCR-30-INT-3 ..... N75-23741 #
OCR-80-F ..... N75-23740 #
OCR-82-INT-1-VOL-3 ..... N75-24127 #
OCR-91-INT-1 ..... N75-24153 #

OHIO-DOT-14-74 ..... N75-24091 #

ORAE-R51 ..... N75-23540 #

ORNL-EIS-74-52-VOL-2-NO-6 ..... N75-24532 #

ORNL-TM-4731 ..... N75-23973 #

ORO-3027-26 ..... N75-24444 #
ORO-3665-44 ..... N75-23764 #
ORO-3935-43 ..... N75-23769 #
ORO-3947-11 ..... N75-23712 #
ORO-3992-198 ..... N75-23894 #
ORO-4485-2 ..... N75-24365 #

OWRT-A-024-SC(4) ..... N75-24080 #
OWRT-A-024-SC(5) ..... N75-24093 #
OWRT-A-042-CONN(5) ..... N75-24079 #
OWRT-A-054-KY(1) ..... N75-24092 #
OWRT-A-071-MICH(1) ..... N75-24184 #

OWRT-B-026-HI(1) ..... N75-24261 #

OWRT-B-150-CAL(5) ..... N75-24404 #
OWRT-B-150-CAL(6) ..... N75-24405 #

OWRT-C-4276(9045)(1) ..... N75-23897 #
OWRT-C-5208(4211)(1) ..... N75-24090 #

PA-TR-4797 ..... N75-23528 #

PB-237535/0 ..... N75-24175 #
PB-237581/4 ..... N75-24169 #
PB-237582/2 ..... N75-24170 #
PB-237583/0 ..... N75-24171 #
PB-237584/8 ..... N75-24172 #
PB-237585/5 ..... N75-24174 #
PB-237611/9 ..... N75-24173 #
PB-237626/7 ..... N75-24176 #
PB-237750/5 ..... N75-24177 #
PB-237940/2 ..... N75-23939 #
PB-238094/7 ..... N75-24180 #
PB-238109/3 ..... N75-24154 #
PB-238304/0 ..... N75-24179 #
PB-238322/2 ..... N75-24074 #
PB-238324/8 ..... N75-24189 #
PB-238368/5 ..... N75-24400 #
PB-238431/1 ..... N75-24073 #
PB-238448/5 ..... N75-23895 #
PB-238461/8 ..... N75-24091 #
PB-238506/0 ..... N75-24136 #
PB-238529/2 ..... N75-24127 #
PB-238533/4 ..... N75-24132 #
PB-238535/9 ..... N75-24152 #
PB-238537/5 ..... N75-24138 #
PB-238554/0 ..... N75-23855 #
PB-238572/2 ..... N75-24134 #
PB-238578/9 ..... N75-24151 #
PB-238631/6 ..... N75-24079 #
PB-238644/9 ..... N75-24386 #
PB-238646/4 ..... N75-24147 #
PB-238653/0 ..... N75-24200 #
PB-238658/9 ..... N75-24133 #
PB-238666/2 ..... N75-24131 #
PB-238675/3 ..... N75-24078 #
PB-238681/1 ..... N75-24374 #
PB-238688/6 ..... N75-24195 #
PB-238742/1 ..... N75-24343 #
PB-238748/8 ..... N75-24436 #
PB-238749/6 ..... N75-24158 #
PB-238772/8 ..... N75-23693 #
PB-238821/3 ..... N75-24403 #
PB-238839/5 ..... N75-24664 #
PB-238844/5 ..... N75-24077 #
PB-238845/2 ..... N75-23974 #
PB-238846/0 ..... N75-24075 #
PB-238848/6 ..... N75-24076 #
PB-238901/3 ..... N75-24663 #
PB-238914/6 ..... N75-23618 #
PB-238920/3 ..... N75-24185 #
PB-238921/1 ..... N75-23960 #
PB-238927/8 ..... N75-24182 #
PB-238938/5 ..... N75-24552 #
PB-238943/5 ..... N75-24412 #
PB-238944/3 ..... N75-24401 #
PB-238947/6 ..... N75-24137 #
PB-238948/4 ..... N75-24238 #
PB-238949/2 ..... N75-23958 #
PB-238950/0 ..... N75-23959 #
PB-238952/6 ..... N75-24149 #
PB-238954/2 ..... N75-24548 #
PB-238957/5 ..... N75-24411 #
PB-238971/6 ..... N75-24377 #
PB-238972/4 ..... N75-24402 #
PB-238973/2 ..... N75-23741 #
PB-238994/8 ..... N75-24130 #
PB-239019/3 ..... N75-23909 #
PB-239044/1 ..... N75-24019 #
PB-239052/4 ..... N75-24178 #
PB-239055/7 ..... N75-23538 #
PB-239056/5 ..... N75-23537 #
PB-239057/3 ..... N75-23536 #
PB-239058/1 ..... N75-23535 #
PB-239075/5 ..... N75-24153 #
PB-239099 ..... N75-24128 #
PB-239100/1 ..... N75-24155 #
PB-239110/0 ..... N75-24196 #
PB-239114/2 ..... N75-23718 #
PB-239166/2 ..... N75-24040 #
PB-239169/6 ..... N75-24549 #
PB-239184/5 ..... N75-24146 #
PB-239188/6 ..... N75-23774 #

PB-239192/8 ..... N75-24080 #
PB-239212/4 ..... N75-24551 #
PB-239220/7 ..... N75-24378 #
PB-239221/5 ..... N75-24198 #
PB-239227/2 ..... N75-24184 #
PB-239236/3 ..... N75-24139 #
PB-239259/5 ..... N75-24092 #
PB-239270/2 ..... N75-24150 #
PB-239273/6 ..... N75-24523 #
PB-239274/4 ..... N75-24538 #
PB-239275/1 ..... N75-24539 #
PB-239277/7 ..... N75-24157 #
PB-239278/5 ..... N75-23857 #
PB-239282/7 ..... N75-24156 #
PB-239289/2 ..... N75-23797 #
PB-239291/8 ..... N75-24144 #
PB-239292/6 ..... N75-24140 #
PB-239293/4 ..... N75-24666 #
PB-239294/2 ..... N75-24667 #
PB-239295/9 ..... N75-24668 #
PB-239331/2 ..... N75-24194 #
PB-239344/5 ..... N75-24186 #
PB-239345/2 ..... N75-24187 #
PB-239356/9 ..... N75-23740 #
PB-239372/6 ..... N75-24159 #
PB-239375/9 ..... N75-24547 #
PB-239382/5 ..... N75-24426 #
PB-239392/4 ..... N75-24135 #
PB-239398/1 ..... N75-24261 #
PB-239407/0 ..... N75-24093 #
PB-239419/5 ..... N75-24145 #
PB-239429/4 ..... N75-24351 #
PB-239431/0 ..... N75-24404 #
PB-239432/8 ..... N75-24405 #
PB-239451/8 ..... N75-24541 #
PB-239466/6 ..... N75-24199 #
PB-239467/4 ..... N75-23956 #
PB-239471/6 ..... N75-24553 #
PB-239472/4 ..... N75-24089 #
PB-239479/9 ..... N75-24088 #
PB-239492/2 ..... N75-24550 #
PB-239504/4 ..... N75-24554 #
PB-239510/1 ..... N75-24197 #
PB-239514/3 ..... N75-24148 #
PB-239519/2 ..... N75-24090 #
PB-239528/3 ..... N75-24527 #
PB-239536/6 ..... N75-23897 #
PB-239554/9 ..... N75-24352 #
PB-239585/3 ..... N75-24223 #
PB-239586/1 ..... N75-24224 #
PB-239587/9 ..... N75-24225 #
PB-239668/7 ..... N75-23692 #
PB-239867/5 ..... N75-24087 #

PEL-230 ..... N75-23730 #

PH-137 ..... N75-23818

PH/75/3 ..... N75-24456 #
PH/75/4 ..... N75-24457 #
PH/75/5 ..... N75-24458 #

POLY-EE/EP-75-003 ..... N75-23833 #

PPG-177 ..... N75-24487 #

PR-22 ..... N75-24055*#

PRF-7761 ..... N75-23718 #

PRRL-74-CR-65 ..... N75-24518 #
PRRL-75-CR-2 ..... N75-24536 #
PRRL-75-CR-16 ..... N75-23861 #

PSU-IRL-SAR-75/1 ..... N75-24210*#

QPR-3 ..... N75-23866 #
QPR-4 ..... N75-24294*#
QPR-8 ..... N75-24056*#

QR-1 ..... N75-24296*#
QR-2 ..... N75-23652*#
QR-3 ..... N75-24137 #
QR-3 ..... N75-24156 #
QR-3 ..... N75-24159 #
QR-7 ..... N75-23944 #

R-74-59 ..... N75-23868 #
R-74-048-4 ..... N75-23953 #

R-671 ..... N75-24516 #
R-674 ..... N75-23731 #
R-1654-ARPA ..... N75-24251 #
R-9690 ..... N75-23680*#

RADC-TR-74-325-VOL-1 ..... N75-24387 #
RADC-TR-74-325-VOL-2 ..... N75-24388 #
RADC-TR-74-325-VOL-3 ..... N75-24389 #
RADC-TR-74-325-VOL-4 ..... N75-24390 #
RADC-TR-74-325-VOL-5 ..... N75-24391 #
RADC-TR-74-325-VOL-6 ..... N75-24392 #
RADC-TR-74-325-VOL-7 ..... N75-24393 #
RADC-TR-74-325-VOL-8 ..... N75-24394 #
RADC-TR-74-345 ..... N75-23954 #
RADC-TR-75-16 ..... N75-23955 #
RADC-TR-75-18 ..... N75-23863 #
RADC-TR-75-21 ..... N75-23868 #
RADC-TR-75-23 ..... N75-24537 #
RADC-TR-75-31 ..... N75-23952 #
RADC-TR-75-43 ..... N75-24367 #
RADC-TR-75-56 ..... N75-23858 #

RAE-LIB-TRANS-1800 ..... N75-24033 #
RAE-LIB-TRANS-1834 ..... N75-24384 #

RD-75-17 ..... N75-23526 #

RE-75-13 ..... N75-23552 #

REP-M74-14 ..... N75-24049 #
REP-M74-114 ..... N75-24284 #

REP-73-11 ..... N75-23974 #
REP-73-12 ..... N75-24077 #

REPT-8J300A-5 ..... N75-23862 #
REPT-73-16 ..... N75-23754*#
REPT-74/7-9 ..... N75-24214 #
REPT-74/10-12 ..... N75-24215 #
REPT-74/66-27 ..... N75-23553 #
REPT-75-10 ..... N75-23543*#
REPT-95 ..... N75-24524 #
REPT-193-S ..... N75-23810 #
REPT-2601-F ..... N75-23960 #

RISO-304 ..... N75-23771 #
RISO-312 ..... N75-23772 #

RK-CR-75-3 ..... N75-23976 #

RR-81 ..... N75-24092 #
RR-358 ..... N75-24548 #

R7-75 ..... N75-23836 #
R74-9 ..... N75-24180 #
R74-56 ..... N75-24547 #
R75-34 ..... N75-23653*#

S-REPT-93-980 ..... N75-24124 #
S-REPT-93-1252 ..... N75-24123 #

S-1764 ..... N75-24468 #

S/T-MEMO-5/73 ..... N75-23991 #

SAI-74-628-WA ..... N75-23979 #

SAM-TR-74-27 ..... N75-24349 #

SAMSO-TR-75-10 ..... N75-24467 #
SAMSO-TR-75-36-VOL-2 ..... N75-23940 #
SAMSO-TR-75-46 ..... N75-23977 #
SAMSO-TR-75-53 ..... N75-23735 #
SAMSO-TR-75-55 ..... N75-23715 #
SAMSO-TR-75-65 ..... N75-23945 #

SAND-74-0205 ..... N75-24213 #
SAND-74-0318 ..... N75-23996 #
SAND-74-0432 ..... N75-23970 #
SAND-74-5821 ..... N75-24420 #
SAND-74-8672 ..... N75-24372 #
SAND-75-8207 ..... N75-23892 #

SAO-SPECIAL-REPT-362-PT-1 ..... N75-24599*#
SAO-SPECIAL-REPT-362-PT-2 ..... N75-24600*#
SAO-SPECIAL-REPT-362-PT-3 ..... N75-24601*#

SAPR-3 ..... N75-23759*#

SASR-1 ..... N75-24210*#

SATR-1 ..... N75-23979 #
SATR-1 ..... N75-24468 #

SBM-902553-11-9 ..... N75-24609 #

SCG-50039R ..... N75-23652*#

SCIENTIFIC-2 ..... N75-24344 #

SC5007.12MR ..... N75-24061*#

SDC-TM-L-4411/002/01 ..... N75-24197 #

SGD-364-PT-1 ..... N75-24647 #
SGD-364-PT-2 ..... N75-24648 #

SM-6000-28 ..... N75-24185 #
SM-8225/FR ..... N75-23687 #

SSM-7402-PT-1 ..... N75-23857 #

SSS-R-75-2556-VOL-1 ..... N75-24247 #
SSS-R-75-2556-VOL-2 ..... N75-24248 #

SU-AIM-256 ..... N75-24398 #

SU-ML-2387 ..... N75-24469 #

SU-SEL-074-055 ..... N75-23859 #

SU-SOL-74-21 ..... N75-24399 #

SU-STAN-CS-74-474 ..... N75-24398 #

SU-TR-4963-1 ..... N75-23859 #

SUDAM-75-1 ..... N75-24045 #

TAE-243 ..... N75-24031 #

TDCK-65293 ..... N75-24332 #
TDCK-65294 ..... N75-24333 #
TDCK-65300 ..... N75-24167 #
TDCK-65348 ..... N75-24168 #
TDCK-65367 ..... N75-24335 #
TDCK-65368 ..... N75-24334 #
TDCK-65496 ..... N75-23810 #
TDCK-65518 ..... N75-24310 #
TDCK-65564 ..... N75-24336 #
TDCK-65575 ..... N75-24337 #
TDCK-65576 ..... N75-24340 #
TDCK-65577 ..... N75-24338 #
TDCK-65584 ..... N75-24339 #
TDCK-65585 ..... N75-24329 #
TDCK-65586 ..... N75-24341 #
TDCK-65628 ..... N75-24330 #
TDCK-65633 ..... N75-24314 #
TDCK-65777 ..... N75-24331 #
TDCK-65816 ..... N75-24312 #
TDCK-65817 ..... N75-24311 #
TDCK-65818 ..... N75-24313 #

TE-5392-34-75 ..... N75-24154 #

TFR/7404/1112 ..... N75-23716 #

THD-1-9-72-504-1F ..... N75-24019 #

TM-73-5 ..... N75-24077 #
TM-73-6 ..... N75-23974 #
TM-74-1 ..... N75-24252 #
TM-74-01 ..... N75-23478*#
TM-75-5 ..... N75-23829 #
TM-75-48 ..... N75-24639*#

TR-1 ..... N75-24348 #
TR-2 ..... N75-24410 #
TR-6 ..... N75-23780 #
TR-14 ..... N75-24049 #
TR-19 ..... N75-24416 #
TR-74-01 ..... N75-23887*#
TR-74-05 ..... N75-23477*#
TR-138 ..... N75-23689 #
TR-140 ..... N75-23796 #
TR-160 ..... N75-23739 #
TR-302-2 ..... N75-23654*#
TR-320 ..... N75-24284 #
TR-350 ..... N75-24426 #
TR-0075(5530)-11 ..... N75-23735 #
TR-0075(5539)-1 ..... N75-24467 #
TR-0075(5641)-4 ..... N75-23977 #
TR-0075(5901-03)-4 ..... N75-23945 #
TR-0075(9250-03)-3 ..... N75-23715 #

TRITA-EPP-74-19 ..... N75-24482 #
TRITA-EPP-74-20 ..... N75-24483 #
TRITA-EPP-74-21 ..... N75-24484 #
TRITA-EPP-74-22 ..... N75-24485 #
TRITA-EPP-74-23 ..... N75-24486 #

TRRL-LR-658 ..... N75-24040 #

TRW-13111-6033-RO-00 ..... N75-23880*+
TRW-20384-6002-RU-01 ..... N75-23679*#
TRW-27054-6005-TU-00 ..... N75-24419*#

TSC-USCG-74-6 ..... N75-23811 #

TT-70-57759 ..... N75-23691 #
TT-71-51011 ..... N75-24086 #
TT-71-58001 ..... N75-23737 #
TT-72-52001-VOL-2 ..... N75-23738 #
TT-73-50032 ..... N75-24250 #
TT-73-50040 ..... N75-24193 #
TT-74-50021 ..... N75-24220 #
TT-74-50025 ..... N75-24190 #
TT-74-50029 ..... N75-24219 #
TT-74-58010 ..... N75-23781 #
TT-7408 ..... N75-23612 #
TT-7410 ..... N75-24545 #

U-OF-IOWA-75-16 ..... N75-24605*#
U-OF-IOWA-75-17 ..... N75-24209*#

U-6121 ..... N75-23956 #

UAG-37 ..... N75-24221 #

UARL-N991208-36 ..... N75-23946 #

UARL-R911810-10 ..... N75-23528 #

UCID-16665 ..... N75-24443 #

UCLA-ENG-7504 ..... N75-24397 #

UCRL-51725 ..... N75-24480 #
UCRL-75320 ..... N75-23728 #
UCRL-75727 ..... N75-24513 #
UCRL-75814 ..... N75-23969 #
UCRL-76015 ..... N75-23809 #
UCRL-76234 ..... N75-24385 #
UCRL-76280 ..... N75-24452 #

UDC-621.391.837.3 ..... N75-23819

UHMET-74-01 ..... N75-24261 #

UILU-ENG-75-2204 ..... N75-24516 #
UILU-ENG-75-2208 ..... N75-23731 #

UIUCDCS-R-74-619 ..... N75-24412 #
UIUCDCS-R-74-680 ..... N75-23855 #
UIUCDCS-R-74-682 ..... N75-23837 #
UIUCDCS-R-74-687 ..... N75-24386 #
UIUCDCS-R-74-688 ..... N75-24401 #

UM-HSRI-PF-74-10 ..... N75-24554 #

UM/RAO-70-3 ..... N75-24593*#

UMICH-01357-38-T ..... N75-23895 #
UMICH-01357-39-T ..... N75-23909 #
UMICH-010808-1-F ..... N75-23726*#
UMICH-012449-6-I ..... N75-23959 #
UMICH-012449-7-I ..... N75-23958 #

UND-75-1 ..... N75-24041 #

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US-PATENT-APPL-SN-568541 ..... N75-23476*#

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US-PATENT-CLASS-250-211R N75-23910*

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USAARL-75-11 ..... N75-24357 #

USAAVSCOM-TR-73-34 ..... N75-23541 #

USCG-D-70-75 ..... N75-23943 #
USCG-D-80-75 ..... N75-23811 #

USN-CCVS-74-VOL-04 ..... N75-24395 #
USN-CCVS-74-VOL-12 ..... N75-24375 #

U440-74-103 ..... N75-23897 #

WEAT-16 ..... N75-24228*#

WHM-13 ..... N75-24149 #

WHOI-75-3 ..... N75-24285 #

WHO-401 ..... N75-24234 #

WOLF-00079 ..... N75-24644*#

WPL-34 ..... N75-24406 #

WRRI-47W75-04051 ..... N75-24080 #

WSG-74-3 ..... N75-24287 #

WTHD-65 ..... N75-24364 #
WTHD-66 ..... N75-24355 #
WTHD-67 ..... N75-24325 #
WTHD-68 ..... N75-24431 #

W75-03301 ..... N75-24079 #
W75-04038 ..... N75-24184 #
W75-04147 ..... N75-24092 #
W75-04442 ..... N75-24261 #
W75-04539 ..... N75-24405 #
W75-04540 ..... N75-24404 #
W75-04558 ..... N75-24090 #
W75-04559 ..... N75-23897 #

X-644-73-352 ..... N75-24067*#
X-660-75-96 ..... N75-24646*#
X-660-75-130 ..... N75-24643*#
X-661-75-98 ..... N75-24595*#
X-661-75-114 ..... N75-24596*#
X-661-75-115 ..... N75-23924*#
X-672-75-113 ..... N75-24594*#
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